JOURNAL

OF THE

Department of Agriculture

OF

WESTERN AUSTRALIA.

Vol. 4. (Second Series) MARCH, 1927. No. 1.

THE UNWELCOME VISITOR.

The Editor.

It will be generally conceded that Western Australia's reputation for hospitality stands high. There have been many occasions when the itinerant has departed from our shores expressing genuine regret at leaving a people who backed the hand of friendship with the spirit of benevolence and good will. So strong and so lasting have been some of the impressions created that more than one distinguished traveller has subsequently elected to return again and find an abiding place in this, our Land of Hope. At all times and at all seasons it has been our delight to extend a welcoming hand to the visitor, the traveller and the immigrant.

But to all things there are exceptions.

It will tax the credulity of many to learn that within the past few weeks a diminutive couple, travelling with the American tourists on that luxurious pleasure liner, the "Carinthia," proved the rule of our hospitality by providing the exception. There was no mistaking the hostility with which their arrival was regarded, for our gestures of repulsion were unequivocal; indeed, the ferocity of one citizen's spirit found ebullition in immediate personal violence, and a climax in the slaughter of one victim. Though the survivor of the unfortunate pair eluded the hostilities aimed at his person he will find no sanctuary throughout the land. A price has not yet been placed on his head, but he has been promptly outlawed by the authorities while the highest commendations are promised his successful captor or assassin. We use the pronoun "he," perhaps unadvisedly, but even should the fugitive prove of the gentler sex there will be no abatement of the decree.

That such things should happen in Western Australia in our twentieth century civilisation may appear to some appalling, and lest our readers be ere this unduly perturbed it is high time to inform them that these unwelcome

visitors were none other than members of the Sparrow family. Now it is on record that there are in this and the other States worthy citizens, law-abiding, honest folk of irreproachable repute, who rejoice in that patronymic, but in the particular instance under review the pariah pair were of the winged and feathered tribe, no more entitled to the law's protection than, say, the wing-helmeted marauders that harried the coast of Britain in the early centuries. Undesirables, we wish to keep this part of Australia free from the depredations of these prolific pests.

Fortunately the history of the sparrow in this State is confined to minor incidents in a brief career that failed to find establishment. Some years ago, it is recorded, two were discovered and shot in the Perth Government Gardens. Again, about six years past, rumors of a threatened invasion caused the Department of Agriculture to despatch an inspector to reconnoitre eastwards. At Ooldea, beyond our eastern border, the vigilant officer succeeded in shooting up a colony of eight birds. Since then reports frequently come to hand, apparently authentic, indicating that sparrows have been seen, but on investigation they have proved to be no more than bush birds without terrors for the farmer or the husbandman. Since the "Carinthia" episode numerous birds have been brought to the Department of Agriculture for inspection, many of which have not the slightest resemblance to the sparrow, and these are duly handed over to the Museum authorities. Their collection, however, points the fact that our citizens are wide awake to the importance of preventing the plague, and, be it said to their everlasting credit, they evidence a keen appreciation of the advantages of co-operation.

It is interesting to note the alarm with which the introduction of the sparrow into the Eastern States was viewed some years ago. According to *The Agricultural Gazette of New South Wales*, the English House Sparrow was introduced into that State by a Mr. Young, a merchant who resided on the Glebe Point Road, Sydney, about 65 years ago. Mr. C. Robinson, of Woodlands, Gosford, is responsible for supplying this information and amplifies it by the remark that the House Sparrow was introduced in mistake for the Hedge Sparrow, and that shortly after its introduction it became much disliked by the gardening fraternity for its predacious proclivities. It is believed that their introduction into Victoria took place about the same time. It does not appear, however, to have caused very great concern until about the year 1890, when at a conference of fruit-growers, the sparrow was mentioned twice, and then only by way of warning. At that conference Mr. W. H. McKeown, Roseville, Gordon, said—

> "I have now to speak of another pest, which although only in its infancy, is sufficient to cause alarm, viz., the sparrow. If it is not dealt with promptly I am afraid it will prove more serious than the flying fox. In the grain and grape-growing districts it must become

a difficulty only second to that of rabbits and hares. Each year will make it more difficult to cope with these birds, so rapidly are they increasing."

Another speaker, the late Dr. Norton, said—

"The sparrow is mischievous, filling gutters of houses, destroying whole crops of millet and other grain, flower and vegetable seeds, and young plants; often driving away some of our useful Australian birds. The bird it was intended to introduce was no doubt the useful Hedge Sparrow, but its impudent larrikin substitute is here and feels thoroughly at home. It is not likely to be got rid of, in spite of the efforts at extermination which have already been commenced in some places."

The sparrow is a great hustler and drives away other birds in its quest for provisions and its own personal comfort. His hustling habits in England are said to have had a wide-spread effect, for in doing away with the sparrow it has resulted in a decrease of insect pests, because native insect feeding birds have been able to feed in peace and have at last returned to their old haunts in the farms and orchards.

We know enough of the malefit of the sparrow but of what benefit is he in the scheme of Nature? Scripturally his value at the beginning of the Christian era was assessed at two for a farthing, but whether this was a price paid for proof of his destruction or the value to some providential but kindly disposed Egyptian housekeeper who desired to regale her sacred cat, there is no means of enlightenment. It is sufficient concern for us to see that so far as Western Australia is involved the sparrow is kept conspicuous by his absence.

"THE JOURNAL OF AGRICULTURE"

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FLAG SMUT OF WHEAT.

VARIETAL RESISTANCE TEST.

W. M. CARNE, Botanist and Plant Pathologist, and E. J. LIMBOURN.

Flag Smut has been known in this State since 1921. Though still relatively unimportant as compared with Ball Smut or Takeall, isolated crop losses of 3 to 5 per cent. are reported each season, but the loss does not reach 0.25 per cent. of the State's wheat crop. There is, however, no reason to hope that it will never become of greater importance. It was many years after being first known before it became one of the major wheat diseases of South Australia, Victoria, and New South Wales. It has been estimated that there is an annual average loss of 3 per cent. over the whole crop in those States, with individual crop losses of 10 per cent. not uncommon and occasional losses ranging up to 70 per cent.

Field observations in Western Australia since 1922 and the evidence of growers indicated the decided susceptibility of certain varieties, particularly Gluyas Early and Merredin, and an equally definite resistance of Nabawa and Yandilla King. To test these observations and to obtain data in regard to other varieties, a test was carried out last season at the Merredin Experiment Farm.

A plot of ground well isolated from the main cropping paddocks was set aside for this purpose.

Infecting the Seed.—A quantity of infected straw (mainly flag) was very finely minced, in order to get the spores as free as possible. To infect the seed one hundred grains of each variety were mixed with two teaspoonfuls of the minced infected straw and well shaken up. It was found that the spores adhered very well to the brush end of the grain and also in the crease.

Planting.—The plot of ground being only half a chain wide, it was necessary to plant the seeds only half a link apart instead of one link, as in the test rows. The space between the rows was also reduced to one foot.

Each row was opened out with a hoe, and a light sprinkling of superphosphate given before dropping the seed. In order to ensure infection each seed was pressed into the ground with a pinch of the minced infected straw, and any of the latter that remained after planting all the seed was sprinkled along the row before covering the seed with soil.

Germination and early Growth.—The winter rains had commenced before this experiment was planted, and the soil was in a good moist condition. Germination was therefore rapid and very regular, most of the rows showing over 90 per cent. germination.

Early growth, owing to the mild wet conditions, was inclined to be rather rank, and mildew showed up on several varieties.

No definite trace of the disease could be found until late in September, and very few of the plants were badly stunted by it.

The following are the results obtained:—

FLAG SMUT RESISTANCE TEST, 1926.

100 GRAINS PLANTED IN EACH ROW.

Variety.	Infected Plants.	Total Plants.	Infected Plants.	Percentage of Control Rows.
			%	%
Gluyas Early (Control)	19	86	22	100
Nabawa	0	87	0	0
Bunyip	0	77	0	0
(Nabawa and Gluyas Early), C 52	1	82	1	5
(Toby's Tusk and Nabawa), MD3 ...	0	83	0	0
(Nabawa and Bunyip), M.D. 14	0	84	0	0
Gluyas Early (Control)	17	83	20	100
(Sunset and Gluyas Early), M.D. 15 ...	4	71	6	28
(Comeback and Jap), M.D. 17	1	81	1	5
(Federation and Bunyip), M.D. 18 ...	0	83	0	0
(Nabawa and Sunset), M.D. 19	0	79	0	0
Merredin	21	90	23	105
Gluyas Early (Control)	21	85	25	100
(Minister and Toby's Tusk), C. 46 ...	1	84	1	3
(Minister and Toby's Tusk), C. 47 ...	16	72	22	71
(Fortune and Gluyas Early), C. 48	12	69	17	55
(Fortune and Gluyas Early), C. 49	7	81	9	29
Canberra	14	85	16	52
Gluyas Early (Control)	30	82	37	100
Comeback	1	82	1	3
Carrabin	0	97	0	0
Florence	0	71	0	0
Geeralying	0	82	0	0
Clarendon	1	82	1	3
Gluyas Early (Control)	28	91	31	100
Gresley	2	81	2	6
Bald Early	4	88	5	15
Turvey	3	87	3	9
S.H.J.	0	65	0	0
Newman's Early	3	78	4	12
Gluyas Early (Control)	30	80	37	100
Queen Fan	0	79	0	0
Free Gallipoli	3	90	3	9
Bena	17	81	21	64
Nungarin	10	86	12	36
Federation	5	89	6	18
Gluyas Early (Control)	27	90	30	100
Hard Federation	9	88	10	26
Major	2	96	2	5
Fortune...	5	87	6	16
Wandilla	0	93	0	0
Yandilla King	0	88	0	0
Gluyas Early (Control)	42	90	47	100
Wannon	9	81	11	26
Nizam	6	94	6	14
Minister	6	93	6	14
Roseworthy	3	77	4	9
Waratah	29	92	32	74
Gluyas Early (Control)	35	89	39	100
Sultan	3	97	3	7
Caliph	0	90	0	0
Rajah	1	91	1	2
Ranee	6	86	7	17
Viceroy	10	85	12	29
Gluyas Early (Control)	42	94	45	100
Gluyas Early (Control)	34	92	37	100

FLAG SMUT RESISTANCE TEST, 1926—*continued.*

Variety.	Infected Plants.	Total Plants.	Infected Plants.	Percentage of Control Rows.
Confederation	1	93	1	3
Sterling	25	84	30	83
Ghurka	4	89	4	11
Niloc	11	85	13	36
(Bunge, No. 1, and Emmer)	11	87	13	36
Gluyas Early (Control)	32	92	35	100
Baroota Wonder	2	92	2	5
Baroota Wonder, Early	0	97	0	0
Toby's Tusk	1	98	1	3
Mogul	21	81	26	74
Parsee	25	92	27	77
Gluyas, Late	9	94	10	29
Gluyas Early, Control	42	97	44	100

The last column is obtained by comparison with the mean of the two nearest control rows.

Average infection of all control rows, 35 per cent.

FLAG SMUT RESISTANCE TEST, 1926.

SUMMARY OF RESULTS.

Resistant.	Susceptible.		
% Infected Plants.	1—25 %.	26—50 %.	50—100 % and over.
	%	%	%
Baroota Wdr. E.	Rajah 2	Hd. Federation 26	Canberra ... 52
Bunyip	Baroota Wonder 2	Wannon ... 26	C. 48 55
Caliph	Clarendon ... 3	M.D. 15 ... 28	Bena 64
Carrabin	C. 46 3	C. 49 29	C. 47 71
Florence	Comeback ... 3	Gluyas Late ... 29	Mogul 74
Geeralying	Confederation ... 3	Viceroy ... 29	Waratah ... 74
M.D. 3	Toby's Tusk ... 3	B. Bunge No. 1 and Emmer 36	Parsee 77
M.D. 14	C. 52 5	Niloc 36	Sterling ... 83
M.D. 18	M.D. 17 ... 5	Nungarin ... 36	Gluyas Early ... 100
M.D. 19	Major 5		Merredin ... 105
Nabawa	Gresley 6		
Queen Fan	Sultan 7		
S.H.J.	Gallipoli ... 9		
Wandilla	Roseworthy ... 9		
Yandilla King	Turvey 9		
	Ghurka ... 11		
	Newman's Early 12		
	Minister ... 14		
	Nizam 14		
	Bald Early ... 15		
	Fortune... ... 16		
	Ranee 17		
	Federation ... 18		

Varieties arranged according to comparative percentage of control rows.
Gluyas Early controls = 100 %.

The results confirm the field observations as to the susceptibility of Gluyas Early and Merredin and the resistance of Nabawa and Yandilla King. They indicate the value of Nabawa and Bunyip as useful parents in the breeding of resistant varieties. Carrabin, Yandilla King and Queen Fan are also worth testing from this point of view.

It is a routine practice in this Department that all plants in the breeding plots shall be subject to a test for Ball Smut susceptibility, those strains showing high infection being discarded. Owing to the possible importance of Flag Smut in the future, it is proposed to include a test for Flag Smut. The Flag Smut test will also be included in the pure-line breeding of the standard varieties in the hope that more resistant strains of these varieties may be found.

While Ball Smut is a preventable disease through the use of the copper carbonate, bluestone, or formalin seed treatments, Flag Smut, once established on a farm, can only be controlled partially by a careful farm sanitation, including fallows, rotation with oats, stubble burning, etc. Seed treatment is of value only against the chance introduction of the disease on seed wheat. The best defence is the use of resistant varieties.

It is becoming more clearly recognised that little advance can be expected in the maximum yield of wheat varieties, that marked increase of yields is not likely to result from any innate ability of new varieties to yield more than those of to-day. Increases will come on the one hand from better cultural methods and on the other from the reduction of losses due to climatic factors and pests. The object of plant breeders to-day is not so much to produce more heavily-yielding wheats as to secure varieties capable of producing good crops of good quality grain under our average climatic conditions, and at the same time resistant to the diseases to which wheat is hereliable.

PHYSICAL CONDITION OF SOIL.

B. L. SOUTHERN, A.A.C.I.

A previous article dealt with soil types, binding agents in soils, and a brief discussion on soil colloids.

When a substance, such as common salt, dissolves in water it first breaks up into the smallest possible particles of salt capable of separate existence; these particles are known as molecules and are exceedingly small, being invisible under the most powerful microscope. Now a molecule of salt is made up of two atoms—a metallic one called sodium, and a non-metallic one called chlorine. Sodium is a soft silver-like metal which readily catches fire if put into water with which it combines, forming a solution of caustic soda. Chlorine on the other hand is a pale green gas heavier than air, and poisonous if taken in sufficient quantities; it is used for disinfecting, being the active agent of chloride of lime (bleaching powder); this gas was one of the first used by the Germans in the Great War. If, for example, one put a pound of salt in a gallon of water, the white salt crystals disappear, leaving a colourless solution composed of millions of salt molecules, water molecules and some other things called ions, which are formed by the partial disintegration of the salt molecules. The greater the amount of water used the more salt molecules will be converted into ions. There are two kinds of ions formed, sodium ions and chlorine ions, which differ totally from the sodium and chlorine described above in that they carry charges of electricity, the sodium a positive one and the chlorine a negative one. Copper sulphate (bluestone) gives copper ions which are blue, while everyone is familiar with the colour of metallic copper, which is made up of copper atoms of the same colour. Now a positive electric charge neutralises a negative charge when the two are brought together. Generally a colloidal clay carries a negative charge. Similar electric charges repel each other, *i.e.*, a positive charge repels another positive charge and a negative one repels a negative, hence suspended clay particles being negatively charged repel each other; in other words, if left alone they won't coagulate. If we neutralise their charges by adding positive charges, then their repulsive forces are overcome and the particles are free to run together in accordance with definite physical laws of attraction; the result is the particles form large heavy aggregates. Some substances, such as common alum, give ions containing three electric charges on each aluminum ion, so much smaller quantities of these compounds are required to bring about the same result as sodium chloride. Soluble calcium, found in lime and gypsum, carries two charges, so calcium is a better coagulant than sodium. It must be clearly understood that these reactions proceed in identically the same manner in moist soil as well as in, for example, dams containing muddy water. The coagulated particles absorb the precipitating compounds, hanging on to them in proportion to their precipitating powers, and only with difficulty can they be removed. Fortunately most plant foods in the soil form "powerful ions," and it can now readily be seen why plant foods are retained in soils containing colloids, and are not washed out by heavy rains or drainage. Fortunately salt is not readily retained by the soil, and is easily drained out without a great loss of essential plant foods.

By puddling clay which has been treated with lime to break up its plastic properties, it returns to its original plastic state; hence clay soil should never be worked when sodden, else it sets hard and the benefit of fallowing is lost. This may also be said of any heavy soil, whether limed or not.

The coagulating effect of common salt and other substances found in waters containing clay serves to distinguish good from bad waters. If, for instance, a dam water remains cloudy for a day or so without being disturbed, the water is sure to be comparatively free from salt; on the other hand, if the clay settles down quickly, the water is sure to contain a lot of salt. The quality of the water is roughly proportional to the time taken by the suspended matter to settle down.

Diagrams showing the coagulation of clay particles:—

I. Before coagulation.

II. After coagulation.

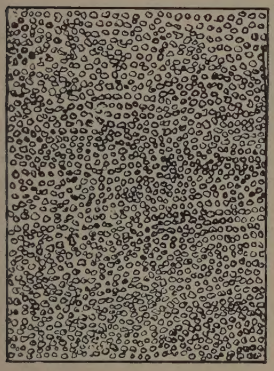


Fig. I.

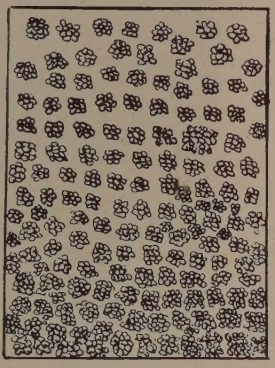


Fig. II.

One of the greatest factors in farming on a large or small scale is the conservation of moisture, and an attempt will be made to show how water conservation is related to the physical condition of soil. Soil water for the sake of convenience is divided into three classes:—1, Hydrostatic; 2, Capillary; 3, Hygroscopic. Hydrostatic water is rain or irrigation water which enters the soil from above and fills up all the spaces between the soil particles; when the water drains away, leaving a film of water around the particles, the film water is known as capillary water. Hygroscopic water is unimportant, being the last traces of film water after the soil has dried; it is of no benefit to the plant. Hydrostatic water (water at rest) is not used by the plant; if excessive then it is exceedingly harmful, for it fills up the air spaces of the soil, and the roots die by suffocation. Capillary water only is absorbed by the roots. If a tube is held in water so that a portion is above the surface the water will rise in the tube above the outside level, the height of the water varying with the diameter of the tube; the smaller the diameter the greater the rise. This phenomenon is known as capillary action; it is well illustrated by means of the ordinary lamp wick. The wick is composed of very fine cotton threads woven together; the threads are cylindrical, so if we pack a number side by side or twist them together, long narrow air spaces will be left between them. When the wick is placed in oil, the oil, besides wetting the wick, rapidly rises up the air spaces. When the lamp is lit the oil at the top of the wick is burnt first, and fresh oil from below takes its place. Water rises from the wet subsoil to the surface soil in the same manner as the oil in the wick only, instead of regular air columns, we have irregular

continuous spaces bounded by soil particles of various shapes and sizes. Water which rises from the subsoil to the surface is also capillary water and availed of by the plant.

A soil to be in a good physical condition must allow hydrostatic water to pass through it, retain a lot of capillary water, and, when it is required, be capable of drawing capillary water from the hydrostatic water in the subsoil. The level at which hydrostatic water comes to rest is known as the water table. The water table may be hundreds of feet below the surface, a few feet from it, at the surface when the soil is waterlogged, or above the surface when a lake or swamp is formed. The function of draining is to lower the water table.

If we were to bore a few small holes in the bottom of an ordinary jam tin, then fill the tin with small stones and immerse the whole thing in a bucket of water, water would immediately enter the tin from the bottom and drive out the air from the spaces between the stones; if the tin was square in shape and the stones cubes such that they would fit perfectly into the tin then there would be no air spaces; but soil particles, like the small stones, are very irregular in shape, consequently they do not pack closely together unless reduced to a very fine powder. It is for this reason we have air spaces for water to occupy. On taking our tin out of the bucket most of the water drains away through the holes; the water running away is hydrostatic, and in the soil, if the drainage is good, slowly finds its way to the water table. The stones in the tin will remain wet with a thin film of water over their surfaces, the thin film being capillary water. Now it naturally follows that the water will drain away from the top stones quicker than from the bottom ones, because the water on the top stones is continually dripping on to the bottom ones, and this will go on until all the stones are dry. It will be seen, therefore, that the film of water around the surface stones will always be thinner than that on those at the bottom. Exactly the same conditions exist in the soil a few hours after rain, when the water is making its way downwards.

The whole principle of water conservation depends on the supply of capillary water, and it will be necessary to determine the conditions under which a soil will contain a maximum quantity of this water and also its ability to obtain it from the subsoil when required. If we consider a box of cube shape such that its internal measurements are one foot long, the same width and depth, its volume would be one cubic foot. For the purposes of this illustration it will be sufficient to assume soil particles are perfectly round. Now a ball one foot in diameter would fit into our box just touching all the sides in six places if the box had a lid. By simple mathematics the volume of this ball would be 0.524 cubic feet. Since the volume of the box is one cubic foot the air space unoccupied by the ball would be 0.474 cubic feet. The surface area of the wall would be 3.14 square feet.* This means if we filled our box containing the ball with water then the hydrostatic water would occupy 0.474 cubic feet, and after the water had drained out there would remain a very thin film of water 3.14 square feet in area over the surface of the wet ball. Supposing we replaced our big ball with balls six inches in diameter, then the box would hold eight such balls just touching each other and the sides of the box. The total volume of these balls would be the same as the big one, 0.524 cubic feet, but the surface area would be 6.28 square

* These figures have been obtained by using the following formulae:—
Vol. of a sphere equals $\frac{4}{3}$ × radius cubed × $\frac{22}{7}$
Area „ „ 4 × radius squared × $\frac{22}{7}$.

feet. Again, by replacing the six-inch balls by three-inch ones, then the figures would be respectively 0.524 cubic feet and 12.56 square feet. It will readily be seen that by decreasing the size of our balls we are making no difference in the space occupied, but we are continually increasing the surface area exposed by them, that is, they have a greater area to be wetted, consequently the same volume of small particles will hold more capillary water than the same volume of larger particles. It has been calculated that the total surface exposed by a cubic foot of finest clay is 173,700 square feet, and of sand 11,000 square feet. It will clearly be seen that the method to increase the capacity of a soil for capillary water is to make the soil particles

Diagrams showing air spaces and capillary water:—

III. Air spaces between shaded soil particles, when the soil is thoroughly wet the air is displaced by hydrostatic water.

IV. Capillary water surrounding soil particles. Note the air spaces.

Fig III.

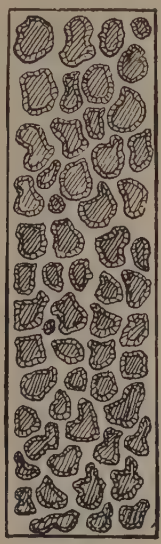


Fig. IV.

as small as possible, but natural influences are at work which make it necessary to modify this statement, the conclusion itself being purely theoretical, but, nevertheless, an extremely valuable one, for it shows the direction in which we must work to obtain the best working results. Unfortunately a soil in perfect physical condition is not in a state to hold the same amount of water that a pure clay holds. What we must determine to find is that condition of tilth which best suits the crops grown and local conditions. Articles of this kind are not meant to advise the farmer what to do with particular types of soil, but to show up the good points and the pitfalls, he must combine his knowledge of local conditions with theoretical considerations; in other words, practice and theory must work side by side in perfect harmony to obtain maximum results, and it must not be forgotten that theory in agricul-

ture and other sciences has been built up on practice. In all scientific work a theory is propounded from known facts, it is then tried out and tested from all points of view, and if it still holds good it becomes a law. The well-known "Law of the Minimum" is a typical example. Early experimenters in agriculture after repeated trials found, when they discovered the essential plant foods, that a plant would only thrive in proportion to the minimum amount present of one of the available plant foods, *i.e.*, if we had ample supplies of available potash and nitrogen, but a deficiency in phosphoric oxide, then growth would only take place in proportion to the phosphoric oxide present no matter what the excess of potash and nitrogen; to get a good crop, therefore, it would be necessary to add a phosphatic manure. This law is generally applied over Western Australian wheat lands because our soils are deficient in phosphoric oxide; this then is the reason for using superphosphate.

The loss of soil moisture depends chiefly on evaporation, drainage, and growth of crops and weeds, but the rates at which these processes go on depend entirely on the nature of the soils—it is greatest in sandy soils and least in clay and peaty ones. Loss by drainage explains itself, but the rates of loss by evaporation need very serious study. A current of hot dry air is the best medium for drying, hence it follows it is best for evaporation. Going back to our lamp wick illustration, and applying the same phenomenon to the soil, we see that the faster water is removed from the surface more will be drawn from the subsoil if the capillary connection is good. The evaporation of water from sand, silt, china clay and ignited soil was found by Dr. Keen to be relatively simple, but not so that from soil on account of its colloidal nature; the colloidal properties of soil are lost when it is burnt. The wetter the soil the greater the rate of evaporation; provided, of course, the humidity and movement of the atmosphere above the soil remain the same. As the moisture content of the soil decreases a competition for moisture starts between the colloids, plants and living organisms, and finally an equilibrium is set up. At this stage there is insufficient water present for the use of the crop, and the plants wilt.

(*To be continued.*)

CODLIN MOTH CONTROL.

Geo. W. Wickens,
Superintendent of Horticulture.

Orchardists throughout the State will be pleased to know that another success has been added to the list of achievements standing to the credit of the Department, and growers, in connection with the above.

On the 30th March, 1925, Mr. Hyne, a fruitgrower of North Dandalup, reported the presence of Codlin Moth in an orchard in that district owned by Mr. Sharp. The discovery was made too late in the season to permit of spraying operations being carried out as a measure of control, and the operations for the time being were limited to destruction of fruit found to be infested, killing all larvae which took refuge in bandages placed around trunks of trees, and burning all props which had been used to support fruit-laden branches. By these means many Codlin caterpillars were destroyed by the time the fruit season was finished.

In the spring and summer of the same year the orchard was sprayed five times during the months of October, November and December with arsenate of lead. The trees were bandaged, the bandages regularly examined every ten days and caterpillars killed, and all fruit found to be infested was destroyed. So effective was this treatment that not a trace of the pest can be found in the orchard this season, though the fruit and trees have been frequently and thoroughly examined. While the departmental officers can lay claim to being primarily responsible for the success of the operations, much credit is also due to Mr. Sharp for the whole-hearted way in which he carried out all instructions issued, and the thanks of all fruitgrowers are due to Mr. Hyne for so promptly reporting the outbreak as soon as he became aware of its existence.

Though the Department and growers concerned have a bigger fight on hand now in the outbreaks which have since been discovered at Collie and Narrogin, the results to date are most encouraging, and we can confidently look forward to wiping the pest out of those districts in the same way as has been done at North Dandalup.

As an instance of what has already been accomplished, it may be mentioned that last season when the pest was first discovered in Collie, Codlin caterpillars were present in hundreds, and there were far more in one small orchard then than have been found this season in the whole of the infested area; the decrease being solely due to the thorough manner in which the measures of control have been carried out.

DUSTING FOR FUNGOUS DISEASES.

W. M. Carne, F.L.S.,
Botanist and Plant Pathologist.

The use of sulphur in dust form has been an effective treatment against powdery mildews. This group of diseases includes the oidium of grapes and the common mildews of pumpkins and related plants, roses, etc. In all cases the fungi responsible for these diseases grow on the surfaces of the plants, and not within their tissues. The fumes given off by the sulphur at temperatures of about 75 degrees Fah., or higher, act directly on the exposed fungoid growth.

Of recent years, following the successful use of insecticides in dust form against certain insect pests of plants, the use of fungicides in dust form has been extended to fungus diseases other than mildews. In principle the aim has been to apply in dust form the same compounds which have proved successful in spraying.

Dust preparations for fungus diseases, and dusting apparatus are now on the Australian market. As dusting has certain obvious advantages over spraying, growers may be led to adopt this method without full consideration of the disadvantages associated with its use.

In the first place it should be pointed out that, while spraying has been on innumerable occasions the subject of investigation by trained workers, little information of the same type is available in reference to dusting. No results have been published of investigations in Australia, and we are practically forced to rely upon American data. Dusting on modern lines originated in the United States, and dusting machinery is mainly American.

It must be admitted that in labour cost and time for actual application of the treatment, dusting has distinct advantages over spraying. Dusting can be done in less than one-half the time taken for spraying. For large orchards, where hand apparatus is out of the question, the initial cost and upkeep of dusting apparatus is less than that for spraying. No water is required, and consequently the weight to be hauled or carried is much reduced. Dusting with hand machines can be done where hand spraying would be out of question. It can therefore be performed on soil too wet for a horse-drawn spray outfit. In addition, less trouble is involved in preparing the material for the dusting machines than for the pumps. Dusts are purchased ready to use; spray materials require dilution with water if purchased ready made, and require time and attention in their preparation if home made.

Turning now to the disadvantages of dusting. The first and most important is that it has not generally given results equal to spraying. Secondly, dusting can be carried out effectively only when there is little or no wind. Thirdly, there is some doubt as to the ability of the dust to remain on the plants during heavy rain. Lastly, dusting preparations are used as purchased, and cannot be made stronger or weaker. When it is necessary to apply treatment to trees at different times, as during the dormant period, at budburst, and in full leaf, it is necessary to have a preparation for each period. With spraying, two or three preparations, such as Burgundy mixture, lime sulphur solution, or atomic sulphur, serve all purposes, being diluted as required, and insecticides being added if desirable. For different crop plants and for use at different times about 20 fungicidal preparations are put up by each company manufacturing dusts.

Going into the foregoing points in more detail, let us first consider the time of application. In the absence of wind, the dusting machines are very effective. In America dusting at night or during the early morning, that is three to six a.m., has been found superior to day work. In local practice the time would have to be adapted to the season. During the summer the nights and mornings are often the windiest parts of the 24 hours. In the reports of a trial dusting for Codlin Moth at Blackwood Experimental Orchard (South Australian "Journal of Agriculture," October, 1926) the manager stated that "on three occasions great difficulty was experienced in evenly distributing it, and that will be, I think, one of the greatest drawbacks to its general use. Liquid sprays can be applied even if there is a certain amount of wind blowing, but dusting cannot be successfully applied under those conditions, and whilst waiting for the necessary calm day the time for doing the job has, perhaps, passed."

Turning now to the efficiency of dusting. Results in America have been very conflicting. Data from the other Australian States is not available. Locally, Bordeaux dusts were tried for grape anthracnose on the Swan last spring. The results of the dormant dusts were not satisfactory, and decidedly inferior to the strong Bordeaux, bluestone, or iron sulphate and sulphuric acid treatments usually used. Later dustings, when the vines were in leaf, were also unsatisfactory and inferior to the copper sprays.

The following are some results taken from American literature. "The Plant Diseases Reporter," Supplement 39, 1925, published by the Plant Disease Survey Office of the U.S.A. Department of Agriculture, states "Copper lime dust has given satisfactory results (with Potato Blight) in some cases, but generally it has not given as good control as spraying." In experiments on the control of Peach Leaf Curl by the New York Experiment Station, it found copper lime dusts less effective as compared with lime sulphur spray. The New Jersey Experiment Station found copper lime dusts less effective than Bordeaux mixture for Leaf Spot on tomatoes. In "Phytopathology," Vol. 16, 1926, results obtained by copper lime dusts on Melon Anthracnose and Pecan Scab are given; in the former the untreated plots had 67.5 per cent. affected melons, 25 per cent. with dust and 20 per cent. with Bordeaux mixture. With Pecan Scab, the untreated trees produced 100 per cent. fruit not marketable, with dusting this was reduced to 62.5 per cent., and with Bordeaux mixture to 26.5 per cent. Against Apple and Pear Scab, the results have been very variable with generally an advantage from spraying.

It is evident that dusting is still in the experimental stage, and considerable improvements may be expected in future.

The American preparations, known as copper lime dusts, consist usually of 15 to 20 lbs. of dehydrated copper sulphate mixed with 75 to 80 lbs. of hydrated lime; 5 to 10 lbs. of the lime may be replaced by an insecticide to combine both fungicidal and insecticidal effects.

The Australian preparations, known as Bordeaux dusts, consist of 10 to 25 per cent. of copper carbonate mixed with either or both sulphur (25 to 50 per cent.) and lead arsenate (10 to 50 per cent.) with kaolin as a neutral filler.

The copper lime dusts are regarded in America as more effective than the Bordeaux dusts, but the latter are apparently less liable to cause foliage burning and fruit russeting. The tendency to burn young leaves and fruit occurs with both copper lime dusts and Bordeaux mixture.

"Copper lime dust has so far proved the most efficient dry substitute for liquid Bordeaux mixture, and is approximately equal when applied to wet foliage, but with dry foliage a certain amount of efficiency is lost." (H. H. Whetzel. Abstract from "Review of Applied Mycology," June, 1926). Dusts are not generally recommended by American writers, except as a possible substitute for spraying.

It must be remembered, to give dusting a fair chance, that enough dust must be applied that the amount of the killing substances is the same as would be used in spraying.

As regards adhesion of dusts in wet weather, no satisfactory data is available. The trials on the Swan last spring were certainly not encouraging, all visible evidence being lost after rain. Bordeaux mixture, however, remained visible on trees through the winter, even after 50 inches of rain. In conclusion, it should be realised that dusting for fungi other than mildews is still in an experimental stage. The dusts so far available are inferior to liquid sprays. At its best, dusting must be regarded as a convenient substitute for spraying where disease is not likely to be severe, or is in vegetable gardens, etc., where spraying is not practised. Where there is a liability to severe outbreaks of disease, or where treatments have to be applied during our wet season, liquid spraying cannot be replaced by dusting with the dusts at present available.

PASTURES.

OLD AND NEW.

P. G. Hampshire,

Superintendent of Dairying.

It may fairly be said that rapid progress has been made within recent years in Western Australia in the development of this most important phase of agricultural prosperity. Pasture represents ideal fodder for all kinds of agricultural live stock, and, as a rule, means the most economical form of feeding stock.

During the last decade we have increased the number of milch cows in Western Australia by 111 per cent., and during the last five years the area of laid-down pasture has been increased by 377 per cent. The number of milch cows at 1914, taking an average of the five previous years, was 28,106. Ten years later, at 1924, taking an average of the five previous years, the number of milch cows was 61,357. The area of laid-down pasture in Western Australia at the commencement of 1921 was 17,265 acres. At the commence-

Pasture on the Groups. Top-dressing Experiment. Mixed Fertiliser. Settler Osborne, Group 41. December, 1926.

ment of 1926, five years later, the area had been increased to 82,465 acres. This is an increase of 65,200 acres in five years, and represents approximately 75 per cent. increase in area each year.

There are other phases of development in regard to pastures in this State which must be taken into consideration in assessing the progress. During recent years this Department has advocated very strongly the top-dressing of pastures, and in this respect has been ably assisted by the fertiliser firms—Mt. Lyell Chemical Works and Cuming Smith & Company Proprietary, Limited, who have supplied large quantities of fertiliser under departmental control to demonstrate its value. We now have results over four years of continuous top-dressing on farms in practically all the principal districts in the South-West of this State. The results in Tables 1, 2, 3, and 4 show that, by the application of 1 cwt. of superphosphate per acre over 65 plots during the last four years, there is an average increased yield of 263 per cent., as compared with 100 per cent. with no manure. During the same period, on these plots 2 cwt. of superphosphate per acre shows an increase of 330 per cent. as compared with 100 per cent. yield without manure.

There is still another important phase in regard to the advantages of top-dressing with superphosphate which is shown in detail in Tables 3 and 4 whereby the percentage of leguminous plants on 44 plots in different parts of the State over four years has been increased to 260 in the case of 1 cwt. superphosphate, and, in the case of 2 cwt. superphosphate per acre, to 300 per cent. over a yield of 100 per cent. without manure. Truly, it may be said we are doing better than growing two blades of grass where one grew previously. In five years we have increased our acreage of blades of grass 3¾ times, and, by top-dressing, we are obtaining 3⅓ times more blades on those acres, and three times greater quality of plants. Mathematically it works out as follows:—3¾ x 3⅓ x 3 = 37.5. This really means we have approximately 30 times more stock feed of the very highest quality to-day than we had five years ago.

Pasture "Sowing on the Burn."
Settler E. Hick, Denmark. November 15, 1926.

TABLE 1.—TOP-DRESSING RESULTS, 1926.

District.	1cwt. Super. per acre.	No Manure.	2cwt. Super. per acre.	Rainfall during Growing Period, 1926.	Average Annual Rainfall.
	Percentage yield.	Percentage yield.	Percentage yield.		
Great Southern—					
Denmark	290	100	363	4,237	4,931
Katanning	243	100	357	2,021	1,846
Kojonup	250	100	237	2,438	2,229
Kulikup	338	100	573	2,506	2,603
Mt. Barker* ...	1,950	100	2,300	2,740	2,941
Narrogin	432	100	480	2,279	2,002
Northam	354	100	485	1,882	1,696
Pingelly	282	100	382	2,261	1,723
Wagin	244	100	244	2,040	1,745
Wandering	277	100	309	3,272	2,478
Wickepin	157	100	171	1,833	1,649
South-Western—					
Balingup	177	100	307	4,400	3,936
Bunbury	115	100	120	4,105	3,653
Busselton	142	100	231	4,046	3,177
Harvey	400	100	600	5,004	3,975
Midlands—					
Dongarra	169	100	262	1,605	1,849
Geraldton	200	100	245	1,512	1,866
Moora	150	100	286	1,935	1,861
Northampton ...	166	100	333	1,994	2,032

* Abnormal; not included in average.

TABLE 2.—TOP-DRESSING RESULTS FOR FOUR YEARS.

Year.	1cwt. Super per acre.	No manure.	2cwt. Super per acre.
	Percentage yield.	Percentage yield.	Percentage yield.
Average, 1926—18 plots ...	244	100	333
,, 1925—15 plots ...	338	100	404
,, 1924—21 plots ...	258	100	305
,, 1923—11 plots ...	204	100	270
Average, 1923–26—65 plots ...	263	100	330

TABLE 3.—PERCENTAGE OF LEGUMINOUS PLANTS, 1926.

District.	1cwt. Super. per acre.	No. manure.	2cwt. Super. per acre.
Great Southern—	per cent.	per cent.	per cent.
Katanning	100	57	100
Kojonup	90	75	95
Kulikup	50	30	75
Mt. Barker	95	negligible	87
Narrogin	100	100	100
Northam	80	10	85
Pingelly	72	negligible	84
Wagin	83	61	87
Wandering	94	47	95
Wickepin	73	negligible	71
South-Western—			
Bunbury	87	75	66
Busselton	47	13	89
Harvey	82	11	95
Midlands—			
Dongarra	40	12	43
Geraldton	27	9	37
Moora	46	negligible	56
Northampton	42	6	48

1 cwt. super. Top-dressing at Katanning. No manure.

TABLE 4.—PERCENTAGE OF LEGUMINOUS PLANTS—RESULTS FOR FOUR YEARS.

Year.	1cwt. Super. per acre.	No Manure.	2cwt. Super. per acre.
	per cent.	per cent.	per cent.
Average, 1926—17 plots ...	71	30	77
,, 1925— 8 ,, ...	57	10	71
,, 1924—15 ,, ...	65	23	77
,, 1923— 4 ,, ...	53	38	68
Average, 1923-26—44 plots ...	65	25	75
Percentage Increase	260	100	300

TABLE 5.—RAINFALL DURING GROWING PERIOD, 1926.

District.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.	Average Rainfall for period.
Balingup	402	539	636	1,175	472	563	613	4,400	34·98
Bunbury	690	638	609	904	499	364	401	4,105	32·81
Busselton ...	439	765	590	960	382	477	433	4,046	28·60
Denmark ...	686	356	382	1,102	572	594	546	4,237	41·12
Dongarra ...	193	161	326	429	253	164	70	1,605	16·45
Geraldton ...	207	142	303	401	231	140	87	1,512	16·51
Harvey	592	718	799	1,168	652	605	470	5,004	36·54
Katanning ...	257	224	234	685	157	189	275	2,021	14·24
Kojonup	373	269	258	816	155	270	297	2,438	18·82
Kulikup	388	324	303	665	249	308	269	2,506	22·12
Moora	203	211	416	537	248	146	174	1,935	15·52
Mt. Barker ...	445	241	217	803	325	384	325	2,740	23·94
Narrogin	236	259	319	529	182	288	266	2,279	16·12
Northam	212	214	291	647	242	118	158	1,882	14·16
Northampton ...	223	174	412	625	240	167	153	1,994	18·03
Pingelly	280	369	250	719	135	300	208	2,261	13·94
Wagin	240	261	284	667	159	202	227	2,040	14·77
Wandering ...	476	426	418	950	270	361	371	3,272	20·78
Wickepin ...	189	243	262	571	137	236	195	1,833	13·36

"Sowing on the Burn."

More general view of experiment, showing scrub, rye-grass, and clovers. Latter completely covered ground.
Settler Speed, Group 3.

TYPE PLANS OF TOP-DRESSING EXPERIMENTS.

A.	Super.
B.	Basic Slag
C.	Basic Super.
as A.	
B.	
C.	
as A.	
B.	
C.	
as A.	

TYPE PLANS OF TOP DRESSING-EXPERIMENTS—*continued.*

A.	Super
B.	Super. + Potash
C.	Super. + Ammonia
D.	Super. + Potash + Ammonia
as A.	
B.	
C.	
D.	
as A.	
B.	
C.	
D.	
as A.	

TABLE 6.—TOP-DRESSING EXPERIMENTS ON GROUP SETTLEMENTS.

1926.

Location.	Manure.	Average Yield.		Average Percentage Yield.
		tons per acre.		
Burgoyne, — Block 476, Group 42, Denmark	Super ...	1·1402	as Hay	100
	Basic Slag	1·0068		93
	Basic Super.	·9800		86
A. McPherson— Block 187, Group 29, Peel Estate	Super. ...	9·43	Green	100
	Basic Slag	7·06		75
	Basic Super	7·70		82
F. Hobbs— Block 9040, Group 5. Manjimup	Super ...	6·93	Green...	100
	Basic Slag...	6·75		97
	Basic Super	6·30		91

SUMMARY.

Experiment.	Super.	Basic Slag.	Basic Super.
Settler Burgoyne, Group 42, Denmark	100	93	86
Settler McPherson, Group 29, Peel Estate	100	75	82
Settler Hobbs, Group 5, Manjimup ...	100	97	91
Average of Experiments ...	100	88	86

Pastures on the Groups. Settler Moore, Group 42.
Sowing Experiment (Mixture "A").
December, 1926.

Table 7.

Location.	Manure.	Average Yield per acre.		Average Percentage Yield.
		tons.		
G. Osborne. Block 468, Group 41, Denmark	Super.	1·099	as Hay	100
	Super. + Potash...	1·408		128
	Super. + Ammonia	1·703		155
	Super. + Potash + + Ammonia	1·703		155
Taylor. Block 188, Group 42, Denmark	Super.	10·01	Green	100
	Super. + Potash...	9·86		98·5
	Super. + Ammonia	9·86		98·5
	Super. + Potash + + Ammonia	9·71		97·0
	Guano	9·71		97·0
F. Hobbs. Block 9040, Group 5, Manjimup	Super.	8·19	Green	100
	Super. + Potash...	6·39		78
	Super. + Ammonia	7·02		86
	Super. + Potash + + Ammonia	7·02		86

SUMMARY.

Experiment.	Super.	Super. + Potash.	Super. + Ammonia.	Super. + Potash + Ammonia.
Settler Osborne, Group 41, Denmark ...	100	128	155	155
Settler Taylor, Group 29, Peel Estate....	100	98·5	98·5	97·0
Settler Hobbs, Group 5, Manjimup ...	100	78	86	86
Average of Experiments ...	100	101·5	113	113

PASTURE DEVELOPMENT AT YOUNG'S SIDING NEAR ALBANY.

The coastal plain between Albany and Denmark presents land of two main types:—

(a) Swamp land growing typically Paper-bark (*Melaleuca sp.*) and Bulrush, which is under water in its natural state but grows excellent crops when drained.

(b) Semi-swamp flat land, often treeless, and almost always sandy in character.

Typically type (b) overlies a hardpan, varying in thickness from a few inches to several feet, composed of "coffee-rock." This coffee-rock is red to dark brown in colour and is a ferruginous standstone, the sand being cemented by iron oxide which has been leached from the original rock and precipitated near the surface of the soil to form a hardpan. This hardpan is impervious to water, causing rapid saturation of the surface soil which is generally not more than 12 inches deep.

The vegetation is typical of the sandy swampy areas of King George's Sound, rich in Restionaceae, with a shrubby growth consisting mainly of Myrtaceae (Tea-tree), Leguminosae and Epacridaceae (Heaths). A few stunted trees consist of Paper-barked Tea-trees (*Melaleuca pubescens*) and Banksia (*B. occidentalis*).

The outstanding features of the photo show species of Restionaceae, the tall Oat Grass (*Evandra aristata*), Blackboy (*Xanthorrhoea Preiseii*), and the Opossum Tail (*Andersonia coerulea*). These plants are characteristic of the area.

Young's Siding Experiment. Typical Virgin Land.

Thousands of acres of this type of country adjacent to a railway are at present idle and unoccupied. An area of 12 acres near Young's Siding, typical of the surrounding country, was chosen in 1923, and experiments conducted to ascertain whether this land could not profitably be brought under

cultivation. Samples of the soil and subsoil were taken and submitted to the Government Mineralogist and Analyst (Dr. E. S. Simpson) for analyses with the following results:—

	(1) Soil.	(2) Sub-soil.
Analyses—		
Roots	*Nil*	*Nil*
Stones	*Nil*	*Nil*
Fine soil	100 per cent.	100 per cent.
Reaction	faintly acid	faintly acid
Nature	sand	sand
Colour	dark brown	light brown
Water sol. salts	·046	·038
Apparent sp. gr.	1·493	1·645
Org. carbon	1·57 % G	·54 % N
Sod. chloride	·023 % G	·020 % G
Chemical analyses on steam dried soils—		
Nitrogen	·109 % N	·059 % L
Hydrochloric acid sol.:		
Lime (CaO) as carb.	·041 % P	·026 % P
Lime (CaO) as sulph., etc. ...	·012	...
Phos. oxide (P_2O_5)	tr. P	tr. P
Potash (K_2O)	·016 % P	·016 % P
Mechanical analyses on steam-dried soils—		
Coarse grade	41·8 %	55·3 %
Medium grade	51·2 %	40·5 %
Fine grade	7·0 %	4·2 %

Standards for plant foods: P, poor; L, low; N, normal; G, good.
Standards for salt: O—0.5% good.

These results show that the soil was lacking in the three principal plant nutrients, *i.e.*, nitrogen, phosphoric acid, and potash, was low in lime, and giving a faintly acid reaction. Although the water soluble salts are low and appear at first sight too small to affect any crops, they include an appreciable amount of iron compounds derived from the underlying "coffee rock," the deleterious effect of which is most marked on plant growth. Organic carbon was high, as might be expected, as the vegetation typical of this land possesses very fibrous roots difficult to separate from the soil. This organic matter apparently is not readily changed into humus or able to supply nitrogen until after at least the first year, as is shown by the results obtained from the application of different manures to the plots.

It will thus be seen that the problem was one embracing—

(a) Drainage.

(b) Increasing the fertility of the soil.

The local Land Development Committee, acting under the instructions of the Department of Agriculture and financed by that Department, have been responsible for the carrying out of the work, and credit is due to these farmers for the enthusiasm shown in connection with these plots. The land was cleared in the autumn of 1924, and drains run out every chain, leading into a main drain 3ft. deep in the southern boundary of the plot. An area was planted in the autumn of 1924 with Subterranean Clover but with poor results. The winter was unusually wet; the virgin soil needed exposure in

order to sweeten it and the drainage was found insufficient. The following February the area was re-ploughed in "lands" 7 yards wide. The drain between each land was deepened to 9 inches with a Martin Ditcher, and connected to a main drain on the south end of the plots. The land was then harrowed, rolled and drilled on 7th April, 1925.

Young's Siding Experiment. Subterranean Clover.
November, 1925.

The aim of the experiment was to discover the plants best suited to this type of country, and also the fertilisers required.

The following seed mixtures were planted, each mixture being on a separate plot of an area .5 acre —

Drooping Flowered Clover (T. cernuum) ...	5½lbs. per acre.
Bokhara Clover	10½lbs. „ „
Lotus major	7lbs. „ „
Subterranean Clover	8lbs. „ „
Paspalum dilatatum	6½lbs. „ „
White Dutch Clover	2 lbs. „ „
Bokhara Clover...	1¾lbs. „ „
Paspalum dilatatum	16lb. „ „
White Dutch Clover	6¾lbs. „ „
Perennial Rye	5½lbs. „ „
Lotus major	2lbs. „ „
White Dutch Clover	1½lbs. „ „
Subterranean Clove	2¼lbs. „ „
Water Couch Roots	
Kikuyu Grass „	

Each of these plots was manured, in triplicate, with the following manures—

Superphosphate 200lbs. per acre.
Superphosphate 200lbs. + Muriate of Potash 100lbs. per acre.
Superphosphate 200lbs. + Sulphate of Ammonia 100lbs. per acre.
Superphosphate 200lbs. + Sulphate of Ammonia 100lbs. per acre.
+ Muriate of Potash 100lbs. per acre.

All plants, except Paspalum dilatatum and Drooping Flowered Clover, germinated well, but all did not continue to flourish to the same extent.

The rainfall for the years 1925 and 1926, during which the experiments have been conducted, is shown below—

Rainfall, 1925-1926—Young's Siding.

——	Jan.	Feb.	Mch.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1925	115	91	194	460	560	473	533	269	402	489	66	326	3,978
1926	21	298	294	628	302	300	981	617	486	477	234	151	4,789
Average (11 years	140	179	207	295	673	676	620	605	475	430	160	134	4,594

It will be noticed that useful rain falls in almost every month, with heavy soaking rains from April to October, necessitating good drainage to dispose of the surplus water rapidly.

When the plots were inspected on 23rd November, 1925, it was noticed that, although no water had lain on the plots during the winter months, growth was best on the ridges running down the centre of the plots.

On examining the drains, it was noticed that "salty" patches were in evidence, which probably also affected the growth on the lower portions of the plots. It was therefore decided to deepen the drains between the plots up to 15 inches depth, which was carried out.

White Dutch Clover apparently withstood the "salty" conditions best, and was in flower at the time of inspection.

Subterranean Clover had given the greatest bulk of feed this year, and was the only plot showing even growth throughout.

Lotus major showed promise, but did not give the same growth as Subterranean Clover.

Among the grasses Perennial Rye Grass and Cocksfoot had grown well and seeded. Paspalum dilatatum was disappointing.

The growth on the plots where Subterranean Clover and White Dutch Clover were planted was cut and weighed to show the effect of the different manurial mixtures used.

WEIGHT OF GREEN FODDER PER ACRE.

——	Average Yields from six plots.	Percentage Yields.	Cost of Manure.
	cwt. qrs. lbs.		s. d.
Superphosphate	85 3 6	100	10 6
Complete Manure	152 3 13	178	45 0
Super. + Sulph. of Ammonia ...	129 3 26	151	30 6
Super. + Muriate of Potash ...	95 0 20	111	25 0

One land newly cleared and ploughed in 1924 had been planted with potatoes, the fertilisers used being 270 lbs. superphosphate, 28 lbs. sulphate of ammonia, and 38 lbs. sulphate of potash per acre. The potato crop was a failure, but the Subterranean Clover planted the following year was the best on the area, showing the benefit of a nitrogenous manure the first year.

The above results show that, even for clovers which are usually credited with being able to obtain their own supplies of nitrogen, on virgin country in order to ensure a good growth liberal supplies of a nitrogenous manure are beneficial, even necessary. It will be noticed that an application of a potassic manure did not give greatly increased yields of fodder.

The area was fed off by cattle during December and January, and again top-dressed on 15th April, 1926, with the same mixtures of manures as in 1925.

Throughout the season the Subterranean Clover, White Dutch Clover, and Lotus Major were prominent.

Subterranean Clover began to dry off early in December and was quite dry by the third week in December, while the White Dutch Clover and Lotus major were green and in flower.

Young's Siding Experiments. "Lotus major."
21st December, 1926.

The only grasses which had survived in any quantity were Cocksfoot and Yorkshire Fog.

Unlike the first year of sowing, the plots receiving nitrogenous manures apparently showed no better growth than the plots receiving super alone. This seems to indicate that, once leguminous plants are well established, nitrogenous manures are superfluous.

SUGGESTIONS FOR CULTIVATION.

1. After having removed trees and large scrub, plough in autumn, if possible, with a mouldboard plough to a depth of 5-6 inches, turning under as much scrub as possible, and in lands not more than 7 yards wide.

2. Roll with a medium weight roller (2-horse), and harrow just enough to loosen the earth around the fibrous roots.

3. Leave fallow until the following autumn. The land should now be disc-cultivated or cross-ploughed if necessary, and will be found to work down finely enough for sowing.

This method is being followed with success by Mr. E. Ovenall, a farmer near Young's Siding.

4. Before seeding, see that the area is well drained to a depth of 15 inches. This can be done with the use of a Martin Ditcher.

Sow a seed mixture containing the following in March:—

Subterranean Clover—4 lbs.
White Dutch Clover—½ lb.
Lotus Major—½ lb.
Perennial Rye Grass—5 lbs.
Cocksfoot—5 lbs.

The Lotus major and White Dutch Clover will not show at their best till the second year.

5. The following manures are recommended:—

First Year—

Superphosphate—200 lbs. per acre.
Sulphate of Ammonia—56 lbs. per acre.
Muriate or Sulphate of Potash—56 lbs. per acre.

Second Year—

Top-dress the area early in autumn (March) with 180lbs. superphosphate per acre.

It is advisable during the winter months to see that the drains are functioning properly.

In regard to the Young's Siding experimental plots, these have been under the supervision of Mr. G. K. Baron-Hay, who has supplied the field notes.

In connection with top-dressing results shown in Table 1, it is desired to record with appreciation the valuable assistance rendered by the Mount Lyell Company and Cuming Smith & Co. Pty., Ltd., in regard to the supply of the fertiliser. The work of planting the experiment, judging and weighing the yields has been conducted by officers of this Branch: Messrs. G. K. Baron-Hay, B.Sc., M. Cullity, B.Sc., J. T. Armstrong, B.Sc., and F. L. Shier, B.Sc., Agricultural Advisers.

With reference to the tables hereunder supplied, it is felt that they are self-explanatory—

Table 1 sets out the districts where experiments have been conducted, the percentage yields as weighed in the field with 1 cwt. and 2 cwt. superphosphate per acre applied in April, and the rainfall during the growing period is shown together with the average annual rainfall.

Table 2 sets out a summary of the 4 years' results obtained on 65 plots.

Table 3 shows the percentage of leguminous plants that were found to be present on the various plots with applications of 1 cwt. and 2 cwt. superphosphate per acre, and on the plots where no manure had been applied. This result has been obtained by a careful dissection of the plant growth harvested.

Table 4 summarises the results over 4 years.

Table 5 shows the monthly rainfall in the different districts during the growing period, and the average for the period.

Table 6 shows the results of top-dressing experiments, using various types of phosphatic fertilisers.

Table 7 shows the results obtained by utilising phosphatic and potash manures, phosphatic and nitrogenous manures, and a complete fertiliser.

PERMANENT PASTURE means PERMANENT PROGRESS.

SILAGE, ENSILAGE, AND SILOS.

Geo. L. Sutton,
Director of Agriculture.

(Continued from page 471—December, 1926.)

When a mass of green forage is exposed to the air it will become hot, and will then either dry out or rot. If, however, the air be excluded—by pressure, or in some other way—the material is preserved, and it becomes silage and will have what are now regarded as its distinctive characteristics of succulence, colour, taste, and smell. The silage will be quite as moist, and is usually a little moister, than the material from which it was made; the colour, however, will be altered, and may vary from a pale yellow or olive green to a very dark brown, almost black. All kinds of silage have a sour taste; some have also a more or less pronounced acid smell, and some an objectionable aroma.

To many farmers, ensilage—the process whereby green forage is conserved in a succulent form—is, at first, astonishing. Because they know that damp or partially cured hay, if stacked, is likely to burn, they expect the mass of much greener material to catch fire, particularly as the mass usually and quickly becomes very hot; when it fails to burn they expect it to rot, because of their experience with damp straw and fresh stable manure. That it does neither is due to the fact that at some time during the process the oxygen in the air amongst the mass becomes exhausted, and as the result of the consolidation which takes place fresh supplies of air are not admitted. After a little experience in the use of, or in the making of silage, the process becomes a commonplace one, and ceases to arouse any special interest.

For over half a century investigations have been conducted with the object of determining what changes take place during ensilage, and the causes thereof. At the outset of these investigations it was found that during ensilage there was a loss of nutrients. Later investigations have confirmed this, but have also shown that the large losses of dry matter, which were originally found, may be so considerably reduced with better methods, that the loss of dry matter in a properly constructed silo need be very little, if any, more than when the same crops are made into hay.

One of the earliest current hypotheses regarding the causes of the changes which take place during ensilage was that they were due to bacterial activity. The American investigators Babcock and Russell, by results reported about 1902, proved that perfectly good silage could be made in the presence of ether or chloroform, and therefore that bacterial activity was not essential to its production.* These workers also showed that good silage could be made with much lower temperature than had been considered necessary.

In the *Journal of Agricultural Science* for July, 1908, Dr. E. J. Russell records the results of his investigations into "The Chemical Changes Taking Place during the Ensilage of Maize." For this purpose green maize was packed into bottles, and treated in different ways. The bottles acted as miniature silos, provision being made for the exclusion of air, and for the

* Quoted by Dr. E. J. Russell, *Journal Agricultural Science*, July, 1908 (2-4).

escape of gases. Further, some bottles were not sealed, and the results with these last showed that the admission of air caused putrefaction and the material rotted, thus proving that the **exclusion of air** is essential to the preservation of the silage which has been formed as the result of the other changes in the green material.

As the green plants from which silage is made consist of plant cells which continue to respire for some time after ensilage commences, and as the cells of all green plants contain substances known as enzymes, which act during the life of the cell, and continue to act even after the death of the plant cell, it was anticipated that the respiratory action of the plant cells and the enzymes would play an important part in the changes which took place. This proved to be so, and Dr. Russell visualised the process in the following words:—

> "When the cells (of the maize plant) are put in they are alive, and their vital functions continue. Respiration goes on and sugar, etc., is used up, but in the absence of air oxidation is not complete, and intermediate bodies, alcohol, acetic acid, butyric and other acids are formed in addition to carbon dioxide and water. The tryptic enzymes of the cell act on the protein forming the usual hydrolytic products, amino acids, diamino acids, etc.; from the nucleo-proteins purin bases are produced in addition. The heat developed during these processes cannot be dissipated, as it usually is in the living plant by the evaporation of water, because water vapour cannot escape from the silo; instead it raises the temperature of the mass. Respiration is accelerated by the increased temperature, but, as no more material is being elaborated and only decomposition is taking place the process soon comes to an end; the cell then dies for want of more substance to break down, it loses its turgidity, and becomes flaccid, causing the mass to settle down. The temperature also steadily falls. The decomposition of the protein, which had also been accelerated by the rise in temperature, can continue even after the cell is dead, because the enzymes when once formed are not dependent on the life of the cell—in other words, it is an autolytic decomposition. Some of the products formed in the above changes inhibit the development of mould, and the general conditions obtaining in the silo are unfavourable to putrefaction. The mass therefore remains good for food for a long time."

It will be seen from the above that the primary and essential causes of the changes during ensilage are the respiratory action of the plant cells whilst living and enzyme activity before and after their death, other subsidiary and non-essential changes may occur, and are due to bacterial activity. The changes are accompanied by considerable self-heating, which results in the loss of dry matter, principally carbohydrates, and also in the decomposition of portion of the true protein. The products which result from the decomposition of the protein are not lost, but cannot be utilised for the building and repair processes for which the true protein is alone suitable. The resulting nitrogenous compounds are, therefore, less valuable as food than the protein from which they are derived.

The presence of organic acids consequent upon the changes which take place during ensilage gives the silage its characteristic taste and smell, and is the basis distinguishing between "sweet" and "sour" silage. All silage is

sour, but all silage has not a pronounced acid smell. This is because the same acids are not present in all kinds of silage. The principal acids present in silage are—

(a) Acetic acid (the acid of vinegar, possessing a sharp acidic smell).

(b) Propionic acid (similar in properties to acetic acid).

(c) Butyric acid (contained in rancid butter and possessing an offensive smell).

(d) Lactic acid (the acid of sour milk, possessing little or no smell, but having a sharp acidic taste).

(a) (b) and (c) are usually referred to as volatile acids, whilst lactic acid is termed a non-volatile acid.

Maize crop at Abba River, suitable for silage and ready for cutting.

When the total quantity of volatile acids is in excess of that of the non-volatile, the silage is known as "acid," because of the distinct acid smell which it then has. The presence of butyric acid imparts a distinctly offensive smell to silage; this is now regarded as an indication that the process has been defective in some respect, and in consequence the silage is partially spoilt. Woodman also states* that in properly made silage butyric acid should be entirely absent, and gives typical figures for the amounts of organic acids present in good maize silage, and which furnish proof of his contention. These are—

	Per cent. of moist silage.
Acetic acid	0·41
Propionic acid	0·04
Butyric acid	0·00
Lactic acid	0·89

* Woodman, *Journal Minister of Agriculture*, May, 1925 (32-2).

At one time all kinds of silage were broadly classified as either "sweet" or "acid," but because of the increased attention being given to the study of silage problems this rough classification proved inadequate, and in 1917 experiments designed to define the different types of silage which were capable of being produced were commenced by Messrs. Amos and Williams.* The experiments were also designed to define the conditions under which each type could be produced. The results of their experiments are set out in the following conclusions:—

1. Many different types of silage may be produced from the same crop according to the conditions of ensiling; the characteristics of the resulting silage varying not only in physical and chemical but also in feeding properties.

2. The following types of silage have been differentiated and some of the conditions of their production ascertained:—

(a) "Sweet" dark brown silage. This type of silage is produced when the temperature of fermentation rises above 45°-50° C. (113°-122° F.); it has not been produced below 45° C. It is frequently produced in stack silage to which air has ready access, but not generally in tower silos except in a shallow layer 6in. to 2ft. thick just below the mouldy surface to which air has ready access. This silage has a dark brown colour, varying in intensity according to the temperature of fermentation, and a sweet pleasant smell resembling that of heated hay. It is readily eaten by stock, but has generally lost a considerable proportion of its food value through excessive heating.

(b) Acid light-brown or yellow-brown silage is produced in tower silos from crops which are moderately mature when cut and allowed to wilt for varying periods according to the initial dryness until the moisture content of the crop approximates 70 per cent. The maximum temperature of fermentation is generally between 30° and 37° C. (86°-99° F.). This silage has a yellowish-brown to brown colour with an acid though pleasant smell probably largely due to acetic acid, the yellowish types being generally the more pleasant. This type of silage is eaten greedily by stock, which thrive upon it, and is to be commended.

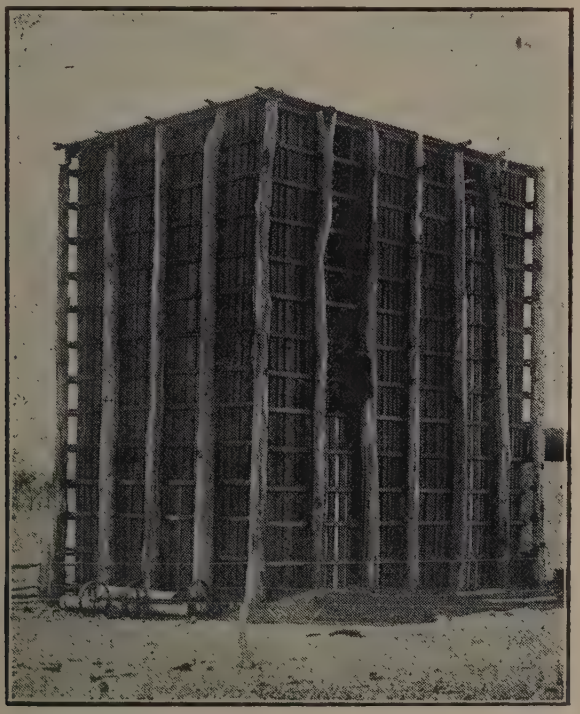
(c) Green "fruity" silage is produced in tower silos from crops which are cut in the earlier stages of maturity from the time of full flower till the seeds are half formed. The crop must also be ensiled soon after cutting. The temperature of fermentation is low and may vary from 22° C. to 34° C. (71.6°-93° F.). This type has a green to olive-green colour with a smell that is neither "sweet" nor "sour," but can best be described as "fresh" and "fruity." It is greedily eaten by stock, which thrive greatly upon it, and Woodman has recently shown that its digestible properties are very high. Green silage suffers from one practical disadvantage: large quantities of juice are liable to drain away from the silage and carry with them soluble food material, which, if allowed to accumulate in the yard, undergoes fermentation and produces a smelly mass of putrid material. If, however, the juice is collected, cattle and pigs readily drink it.

(d) Sour silage is produced under at least two different sets of conditions. It may be produced from an immature and succulent crop, or it may be produced from a crop which has been cut and then saturated by rain before ensiling, especially when the crop has become laid and partially rotten at the base before cutting. Sour silage has a dark brown or olive-brown colour with a pungent and most unpleasant smell, possibly due to butyric acid. Cattle will eat this, but not readily, and do not generally thrive upon it.

* *Journal Agric. Science*, Oct., 1922 (12-4).

(e) Musty silage. One case only of this type had been recorded, in which an over-ripe crop containing much charlock was allowed to wilt and become over-dry before ensiling. A number of tiny mouldy centres were produced in which ammonia was generated. This silage has a dark-brown, almost black, colour, and has a musty ammoniacal smell. Stock refused to eat it, or ate it only under compulsion.

The results of these investigations show that the condition of the crop and the moisture it contains—natural or added—influences the quality of the silage. The worst type —"Musty"—is that made from over-ripe and over-dry material, whilst another only slightly inferior to it is made from immature or excessively wet crops. Both these extremes are to be avoided, and crops should be utilised at a stage of maturity when they are still succulent, but not so succulent that their juices will be pressed from them to drain away on being packed in the silo or pressed in the stack. In selecting the stage at which to cut the crop for silage it is, however, better to err, if at all, on the side of succulence than on that of extreme dryness.



Rectangular silo constructed of bush timber lined with sheet iron. Erected by Mr. Wm. Glasheen, Harrismith.

The one drawback associated with the production of the best type—"green fruity" silage—is the loss of the plant food which drains away in the juices which are pressed from it.

The character of the silage is also influenced by the temperature reached during the process, and as this is governed by the quantity of air in the green material, or admitted to it, and this, in turn, influenced by the pressure, which will not be uniform throughout the stack or silo; it follows that different kinds of silage may be, and are likely to be produced in the same silo. Thus it is common to find "acid" silage at the bottom, and "sweet" silage near the top.

As "green fruity" and "acid light-brown" are the best kinds of silage, and are produced with relatively low temperatures, it is advisable to adopt such steps as are possible to exclude the air and keep down the temperature. In the case of chaffed material these would include cutting the fodder into short lengths, quick filling and good packing; in the case of long unchaffed material of quick filling and pressure. Such measures will also tend to prevent overheating and burning, which takes place when the temperature necessary for the production of "sweet" silage is passed. Such additional heating is associated with the unnecessary destruction of dry matter and consequent loss of food material.

Stone and brick "Tower" silo erected by Messrs. How & Sons, Pingelly.

It is obvious that the self-heating which occurs during ensilage is due to the oxidation of the "dry matter" in the crop. For a long time it was believed that this loss of nutrients must be very considerable even when the

heat generated did not exceed that necessary for "sweet" silage. Messrs. Woodman and Amos,* however, in a recent report, show that on theoretical grounds this is not so. They point out that with the green forage containing 30 per cent. of dry matter, and starting with an initial temperature of 20°C. (68°F.) the temperature could be raised to 51°C. (123.8°F.)—a temperature at which the plant cells cease to respire, and high enough for the production of "sweet" silage—at a cost of only 2 per cent. of the dry matter. It was further shown that this theoretical finding was not discordant with the actual results as found in their investigations, and which showed that good "sweet" silage could be produced without undue loss of dry matter, and that large losses of dry matter were not necessarily due to high temperatures. These results are—

How made.	Character of silage.	Temperature attained.	Loss of dry matter.
		F.	%
Tower or Tub Silo ...	Sweet.	117·7	·71
	do.	127·8	4·51
Stack Silo	do.	152·1	4·70
	do.	170·9	9·40
Clamp or trench ...	Sour.	99·5	25·6

In summing up these writers state—

1. . . . . The amount of destruction of carbohydrate bears no significant relation to the temperature attained during preservation, and the factors of (a) juice drainage, (b) bacterial decomposition of carbohydrate, (c) partial spoiling by undesirable bacterial activity, as with "sour" silage, are of much greater significance in causing unduly large losses of carbohydrate.

2. The results obtained in investigations with crops containing from 26·5 to 33·9 per cent. of dry matter show that "acid brown" silage can be made in the tower silo with an *average* loss of dry matter equal to 5-6 per cent. of that contained in the green crop. It is further concluded that "sweet" silage, if made under good conditions, can also be produced in the tower silo with an *average* dry matter loss of the same order. With "green fruity" silage, the *average* loss under proper conditions of ensilage in tower silos is of the order of 8-9 per cent. The evidence affords strong disproof of the statement that the ensilage of green crops cannot be accomplished without large losses of nutrient matter.

3. Evidence is brought forward in support of the statement that when a silo is filled with crops of fairly uniform moisture content, the lowest losses of dry matter occur in the middle layers of the column of silage.

4. The losses during ensilage may be excessive when the silo is filled with very sappy or rain-laden crops, or when a mass of wet material is superimposed on a crop which has been ensiled at a suitable moisture content. For the purpose of making silage of good quality, and at the same time of keeping down the losses to a minimum, the optimum dry matter content of the green crop appears to lie in the region of 26-34 per cent. When the crop at the time of cutting is wetter than is represented by the lower of these figures, it is desirable to allow a period of wilting, if weather permits, to enable the crop to attain a moisture content in the neighbourhood of 70 per cent. A preservation period of about a fortnight appears to be quite long enough for a green crop to acquire the essential characters of silage.

Journal Agricultural Science, October, 1926 (16-4).

Here is further evidence that the crop should not be too sappy, nor too wet when being made into silage. Provided care is taken in this connection the losses of dry matter need not be excessive, and it is claimed by Woodman† that they need not exceed those which occur during the conversion of a green crop into hay. Such remarks apply to the conditions under which hay and silage may be made in Great Britain where the conditions for hay making are not nearly as good as those which obtain in the agricultural belt of Western Australia. The bleaching which takes place on the outside of the sheaves indicates that chemical changes are taking place, but here the conditions are invariably so good, and so nearly ideal that the loss of nutrients during hay making must be very slight.

The conditions under which silage crops will be cut will also be more uniform so that it is possible that the losses of properly made silage from crops cut at the proper stage of maturity may be reduced. To show the losses which occur in the two best kinds of silage as made at the University Farm, Cambridge, the writer already referred to supplies the following information:—

GAINS OR LOSSES IN SILAGE PRODUCTION.

	Green fruity silage.	Acid brown silage.
	percentage gain or loss.	percentage gain or loss.
Dry matter	—11·2	— 7·7
Crude Protein (including amides)	— 8·2	0·0
Crude oil (mainly organic acids)	+52·4	+45·0
Carbohydrate	—19·1	—14·7
Fibre	— 5·5	— 6·0
Ash (inorganic salts)	— 9·2	0·0
True (crude protein minus amides) ...	—41·0	—28·4
Amides (mainly digestion products of true protein)	+85·3	+96·0

Though these figures show that when silage is made under reasonably good conditions the loss of dry matter is not very great, they do show a very considerable loss of true protein. As already explained this loss in both cases is due to the breaking down of the protein by enzymes, but in the case of the "green fruity" silage the normal loss in this connection is increased, as is also the loss of inorganic salts by drainage of juice away from the silo. Even under good conditions considerable losses of protein in the silo are unavoidable, and as such do not occur in well made hay, it follows that—unless there are very special reasons for doing otherwise—leguminous crops as lucerne, clover, peas, etc., which are specially rich in protein, and which are usually grown to supply farm protein deficiencies, should be made into hay rather than into silage.

Though the loss of dry matter was greater during the transformation of the crop to "green fruity" silage than during the transformation of the same crop to "acid brown" silage, it is pointed out that "green fruity" silage is distinctly superior to the "acid brown" type in regard to palatability, and further it had a very pleasant aroma due to the production by fermentative activity of small quantities of fragrant smelling substances.

† *Journal Minister of Agriculture*, May, 1925 (32-2).

In addition to knowing what loss of nutrients occurs during ensilage, it is also important to know what beneficial, or other effect, the process has upon the digestibility of the nutrients in the green crop from which the silage is made. In this connection some illuminating information* is obtained from the results of an experiment conducted at the University Farm, Cambridge, when determinations were made of the digestibility of green oats and tares, and also of hay and silage made from the same crop, and under conditions which made it possible to secure a fair comparison of the feeding values of the three types of fodder. The results are given in the table hereunder, and are in terms of digestion co-efficients. It may be stated that the digestion co-efficient of a given food constituent represents the number of parts of that constituent which are digested per each one hundred parts consumed:

DIGESTION CO-EFFICIENTS OF GREEN FODDER HAY AND SILAGE FROM THE OAT AND TARE CROP.

	Green oats and tares.	Oat and tare hay.	Oat and tare silage.
	per cent.	per cent.	per cent.
Dry matter	63·7	65·0	64·1
Protein	63·1	68·2	65·1
Crude Oil	51·9	36·8	73·4
Carbohydrate	76·5	71·3	70·5
Fibre	47·6	58·7	57·1

From the above data the following conclusions were drawn:—

(1) The digestibility of the dry matter is of the same order in all three cases.

(2) There is no serious difference in the degree to which the protein of the three fodders is digested.

(3) The digestibility of the oil fraction is greatest in the case of the silage, though it must be remembered that the ether extract of silage is composed almost wholly of organic acids.

(4) The carbohydrates of the hay and silage are approximately of equal digestibility, and in both cases the digestibility is somewhat lower (but not to such an extent as was thought formerly) than that of the corresponding fraction of the green forage.

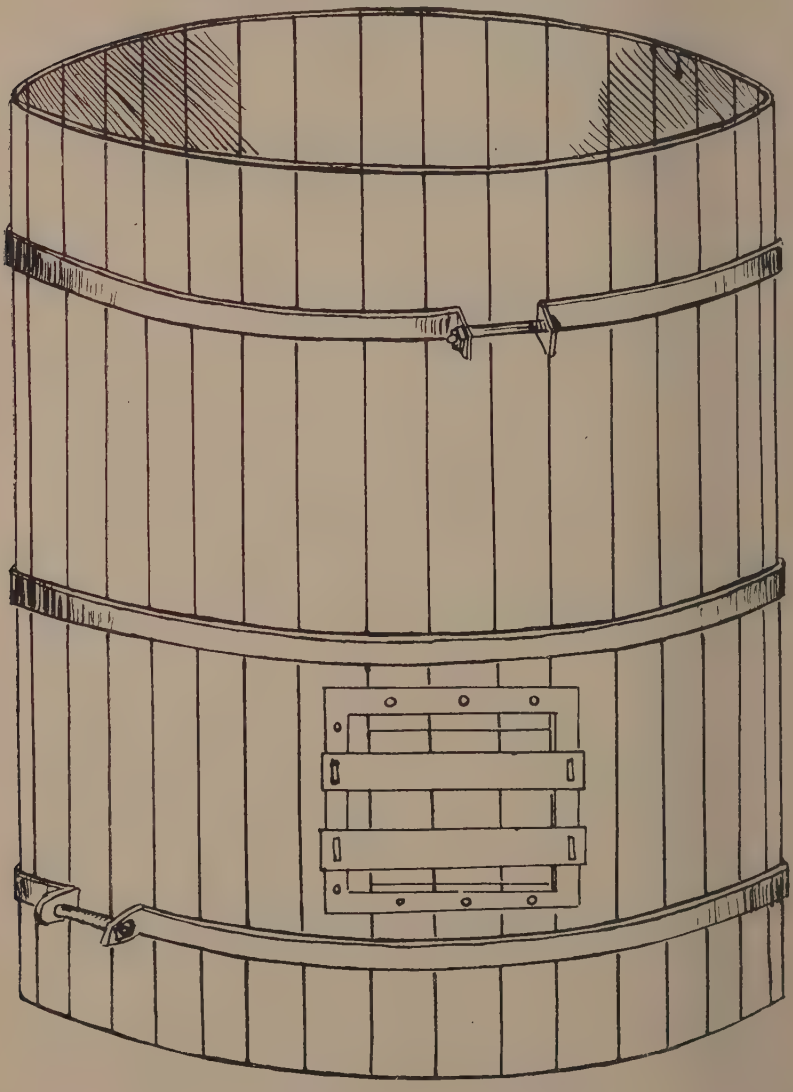
(5) The fibre consituents of the hay and silage are almost equally digested, but the fibre of the fresh green crop possesses an appreciably lower digestibility. This finding confirms the supposition that heating in the stack and in the silo leads to a definite increase in fibre digestibility. In view of the fact that such fodders contain large amounts of fibre, this increase of digestibility becomes of considerable significance.

* Woodman, *Journal Minister of Agriculture*, May, 1925 (32-2).

From what has been learnt about the changes which take place during ensilage, and the causes of them, it is obvious that the two essentials for making good silage are—

(1) that the crop shall be fairly mature, but not ripe, and shall contain not more than 74 per cent. of moisture, nor less than 66 per cent.;

(2) the temperature during ensilage shall not rise much above 122 degrees F.



The simplest form of "stave" silo.

The first essential is determined by, and under the control of the farmer before the commencement of the transformation from green fodder to silage. The second essential is governed by the exclusion of air during ensilage. It therefore, follows that the fundamental principle underlying the transformation from fodder to silage is the *exclusion of air.*

Farmers cannot be expected to determine the moisture content of their silage crops by analytical methods, nor is there any need that they should. The maturity of the crop is a very good guide as to the amount of moisture it contains, and with the latitude of from 66 per cent. to 74 per cent. this may be accepted as a satistactory guide for silage-making purposes. Thus with the cereals the period of full flower is the proper time to cut them, and with the Maize (or "Indian Corn") when the kernels are dented and well on towards maturity. Experience with the general appearance and condition of these crops at the proper stage of maturity will indicate to the farmer the proper stage at which to harvest other crops for the same purpose.

After cutting the crop at the right stage, if air be excluded, the fodder will change to silage and be preserved; if air gain access during ensilage wastage is inevitable, and the more readily the air can gain access the greater will be the waste.

Seeing that high temperatures are not essential to the production of the best kinds of silage, and further, "as an unnecessarily high temperature implies undue destruction of carbohydrates, and may cause an appreciable depression of the digestibility of the protein constituents,"* there is every inducement to keep the temperatures as low as possible. This is effected by the *exclusion of air* as affected by packing and pressure.

With reasonable care useful silage is almost sure to be the result. At the first attempt, or under new conditions, the silage produced may not be just the kind desired, but its condition will indicate how improvements are to be effected, and the methods likely to be most satisfactory under the conditions which obtain on any particular farm.

The causes of, and remedies for, some of the defective kinds of silage are indicated hereunder:—

Unless found on the external surfaces, silage which is not distinctly moist, and is inclined to be dry with a tendency to be mouldy, indicates that the fodder from which it was made was too dry, either from overmaturity, or from wilting, and should have had water distributed over it. When such silage is found on external surfaces its condition is due to its location, and is caused by the admission of excessive, and probably unlimited, quantities of air.

Juice drainage indicates that the crop was either too immature, or contained too much water from external sources, probably rain.

Extremely dark coloured silage indicates that the temperature has been too high, due to excessive oxidation consequent upon the inclusion of or admission of too much air. This calls for more expedition with the work, and the exclusion of air either by packing or pressure.

An offensive smell is caused by too much succulence, *e.g.*, the result of immaturity, or added water with insufficient heating. The remedy is to dry or wilt the crop before ensiling it.

* Woodman, *Journal Minister of Agriculture*, May, 1925 (32-2).

Good silage has been made from many plants including variegated thistles, crowfoot or geranium, and native grasses, as well as from the cultivated crops. Almost any green plants can be made into silage provided care is taken to see that they are harvested at the proper stage of maturity, or after cutting wilted or dried to ensure that their succulence is within the latitude found necessary for the making of good silage, viz., that the percentage of moisture shall range between 66 per cent. and 74 per cent.

On farms silage will be made invariably from cultivated crops, and the crops utilised will be those which can be grown with the greatest ease and most certainty in that particular district. Where Maize (or "Indian Corn") can be grown readily it is a favourite silage crop, and is admirably suited for the purpose, because of its high-yielding capabilities and solid stalks. Sorghum and Sudan Grass are also excellent, and more suitable for districts where the summer rainfall is not liberal enough for reliable and heavy Maize crops.

The winter cereals, wheat, oats, rye and barley make good silage, though at one time they were considered unsuitable because their stems were hollow, and therefore were air filled, and it was anticipated that it would be difficult to control the temperature sufficiently during ensilage to prevent undue waste. This fear has proved to be unfounded. Any difficulty is readily overcome by cutting into short lengths, and close packing by tramping.

The rape plant, and other members of the cabbage family (*Brassicae*) are regarded as unsuitable for silage making, not only on account of their excessive succulence, but also because the silage made from them develops a most objectionable odour.

Though good silage can be made from lucerne, peas, clovers, and other leguminous crops, as already stated, it is considered preferable to make them into hay on account of the greater protein losses when preserved as silage than when made into hay.

Silage can be made in stacks or in silos constructed below the surface of the ground, or erected above it. The underground silos are known as "pit" silos, and a "trench" silo is a special form of "pit" silo. Above ground silos, because of their appearance, are called "tower" silos, and these, if round and made of wood, are sometimes referred to as "tub" silos. The simplest form of wooden silo is constructed of a single layer of planks placed vertically edge to edge with their ends on the ground and held together by means of iron bands, just as the staves of a cask are held together by means of the hoops; silos of this type are known in America is "stave" silos.

The modern silo is undoubtedly the "tower" silo. It can be made of almost any material which is wind and rain proof, and which is also strong enough, or can be supported so as to be strong enough to resist the pressure exerted by the material with which it is filled. They have been constructed of wood, iron sheeting, asbestos sheeting, brick, stone and reinforced concrete, the last named holding pride of place in Western Australia. It is admirably suited for silo construction because of its strength, smoothness, and durability.

The first silos were rectangular, but difficulties arose in connection with packing the material in the corners sufficiently well to prevent decay; even when the corners were partitioned off settlement was hindered, and waste still occurred.

To overcome these difficulties, "tower" silos are usually circular in shape, or, if the material—*e.g.*, asbestos sheets—does not lend itself to this shape, they are made many-sided—12 or 16—so as to have very obtuse angles, and thus little resistance to settlement, and consequent exclusion of air.

The walls of the silo must be rigid and strong for as King* points out, "The outward pressure of cut corn (Maize) silage when settling, at the time of filling, increases with the depth at the rate of 11 lbs. per square foot for each foot of depth. At a depth of 10 feet the lateral pressure is 110 lbs. per square foot, at 20 feet it is 220 lbs., and at 30 feet 330 lbs."; and further, "Because of the great pressure silo walls must be made very strong when

Silo walls must be rigid (after King).
If the pressure whilst filling causes the walls to bulge air is admitted, and wastage results.

they have a depth of 20 or more feet. It is difficult to make deep rectangular silos whose walls will not spread, as represented in the diagram herewith, and where this takes place the walls are crowded away from the silage so much that air can circulate up and down next to the walls, and this results in heavy losses."

The walls of the silo must also be smooth so as to offer little resistance to the settlement of the fodder during ensilage. Unless settlement takes place uniformly air is not thoroughly excluded, with the inevitable loss either by decay or the production of inferior silage.

* "Physics of Agriculture."

King* supplies the following information regarding the quantity of silage in round silos of different diameters:—

TABLE GIVING THE APPROXIMATE CAPACITY OF CYLINDRICAL SILOS FOR WELL MATURED CORN SILAGE, IN TONS (King).

"B."

Depth, in feet.	Inside diameter in feet.											
	15	16	17	18	19	20	21	22	23	24	25	26
20 ...	58·84	66·95	75·58	84·74	94·41	104·6	115·5	126·6	138·3	150·6	163·4	176·8
21 ...	62·90	71·56	80·79	90·57	100·9	111·8	123·3	135·3	147·9	161·0	174·7	189·0
22 ...	67·35	76·52	86·38	96·84	107·9	119·6	131·8	144·7	158·1	172·2	186·8	202·1
23 ...	71·73	81·61	92·14	103·3	115·1	127·5	140·6	154·3	168·7	183·6	199·3	215·5
24 ...	76·12	86·61	97·78	109·6	122·1	135·3	149·2	163·7	179·0	194·9	211·5	228·7
25 ...	80·62	89·64	103·6	116·1	129·3	143·3	158·0	173·4	189·5	206·4	223·9	242·2
26 ...	85·45	97·23	109·8	123·0	137·1	151·9	167·5	183·8	200·9	218·8	237·4	256·7
27 ...	90·17	102·6	115·8	129·8	144·7	160·3	176·7	194·0	212·0	230·8	250·5	270·9
28 ...	94·99	108·1	122·0	136·8	152·4	168·9	186·2	204·3	223·3	243·2	263·9	285·4
29 ...	99·92	113·7	128·3	143·9	160·3	177·6	195·8	214·9	234·9	255·8	277·6	300·2
30 ...	105·0	119·4	134·8	151·1	168·4	186·6	205·7	225·8	246·8	268·7	291·6	315·3
31 ...	109·8	124·9	141·1	158·2	176·2	195·2	215·3	236·3	258·2	281·8	305·1	330·0
32 ...	115·1	135·9	147·8	165·7	184·6	204·6	225·5	247·5	270·5	294·6	319·6	345·7

From the above figures it will be seen that the capacity of a silo is increased at a greater rate than the square of their respective diameters. This is because in the larger silos the friction is less and the silage becomes more compact. Thus doubling the diameter increases the capacity more than fourfold, and therefore silos of large diameter are more economical than small ones. Despite this, however, the diameter of a silo must be **governed by the number of animals to be fed.**

A dairyman's 100-ton "stave" silo.

Silage is fed out of a silo by removing the surface layer daily. It has been found that the rate of removal should not be less than about $1\frac{1}{4}$ inches, and is preferably greater, say, two inches. The following table will serve

*"Physics of Agriculture."

as a guide to indicate the maximum inside diameters of silos to meet the requirements of specified numbers of cows, when each cow is allowed between 35 and 40 lbs. of silage per day:—

THE DIAMETER OF CIRCULAR SILOS IN RELATION TO THE NUMBER OF COWS FED.

No. of Cows.	Maximum diameter of silo when mean quantity of silage removed daily from surface is—		No. of Cows.	Maximum diameter of silo when mean quantity of silage removed daily from surface is—	
	2 inches.	3 inches.		2 inches.	3 inches.
	feet.	feet.		feet.	feet.
10	8·0	6·5	30	13·8	11·3
12	8·7	7·1	32	14·3	11·7
14	9·4	7·7	34	14·7	12·0
16	10·1	8·3	36	15·1	12·3
18	10·7	8·7	40	16·0	13·1
20	11·3	9·2	44	16·7	13·7
22	11·8	9·6	48	17·5	14·3
24	12·4	10·1	52	18·1	14·9
26	12·9	10·6	56	18·9	15·5
28	13·4	10·9	60	19·5	16·0

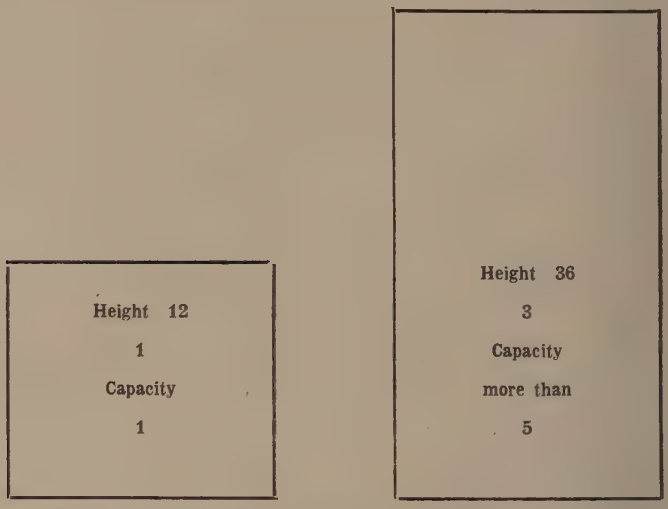
The depth of the silo is determined by the period during which it is intended to feed silage.

Deep silos are preferable to shallow ones, for the capacities of "tower" silos are not in direct proportion to their relative heights. The capacity increases at a greater rate because with the greater depth the material is compressed, and in consequence greater storage capacity is secured. Thus, with silos respectively 12 and 36 feet high, the storage capacity of the latter is five times that of the former, though the respective heights are only as three to one. The following table prepared by King* gives the weight of silage at different depths in "tower" silage.

TABLE SHOWING THE COMPUTED WEIGHT OF WELL MATURED CORN SILAGE AT DIFFERENT DISTANCES BELOW THE SURFACE, AND THE COMPUTED MEAN WEIGHT FOR SILOS OF DIFFERENT DEPTHS, TWO DAYS AFTER FILLING.

Depth of Silage.	Weight of silage at different depths.	Mean weight of silage per cub. ft.	Depth of silage.	Weight of silage at different depths.	Mean weight of silage per cub. ft.	Depth of silage.	Weight of silage at different depths.	Mean weight of silage per cub. ft.
Feet.	lbs.	lbs.	feet.	lbs.	lbs.	feet.	lbs.	lbs.
1 ...	18·7	18·7	13	37·3	28·3	25	51·7	36·5
2 ...	20·4	19·6	14	38·7	29·1	26	52·7	37·2
3 ...	22·1	20·6	15	40·0	29·8	27	53·6	37·8
4 ...	23·7	21·2	16	41·3	30·5	28	54·6	38·4
5 ...	25·4	22·1	17	42·6	31·2	29	55·5	39·0
6 ...	27·0	22·9	18	43·8	31·9	30	56·4	39·6
7 ...	28·5	23·8	19	45·0	32·6	31	57·2	40·1
8 ...	30·1	24·5	20	46·2	33·3	32	58·0	40·7
9 ...	31·6	25·3	21	47·4	33·9	33	58·8	41·2
10 ...	33·1	26·1	22	48·5	34·6	34	59·6	41·8
11 ...	34·5	26·8	23	49·6	35·3	35	60·3	42·3
12 ...	35·9	27·6	24	50·6	35·9	36	61·0	42·8

As the silo is emptied by removing successive layers from the surface and shovelling the silage through the openings or doorways in the wall, it is advisable that these should be as nearly continuous as it is possible to get them. This will obviate the unnecessary lifting of heavy material. For another reason it is also necessary that the distance between the top of the



DEEP SILOS ARE MORE ECONOMICAL THAN SHALLOW ONES.

material in the silo and the bottom of the opening should never be greater than the height of the mouth of the person in the silo. This is necessary because when the silo is being filled carbon-dioxide—a poisonous gas—is generated, and during a still night may accumulate in the enclosed space of a partially filled silo, with possibly disastrous results to the person just entering same. The continued filling of the silo soon displaces this gas, and the danger, even under such conditions as referred to, exists only for a short period, but obviously it is to be avoided.

With reinforced concrete as the building material there is, of course, no difficulty in building circular silos, and complying with all the essential conditions which require that the silo shall be round and deep, with rigid smooth walls, and with an almost continuous doorway.

The exact stage at which the crop intended for silage will be harvested will depend to some extent upon the climatic conditions which obtain, or are likely to obtain at the time. If the weather be hot and dry it will probably be advisable to cut the crop rather earlier than the stage previously indicated, *i.e.*, with the cereals when in full flower, or if cool and showery, at a later stage.

The fodder crop when cut should be placed in the silo with as little delay as is practicable. It may be carted as fast as it is cut, or with limited labour, the cutting may be done in the morning, and the carting in the afternoon. The material is three times as heavy as hay, and low-wheeled vehicles will be found convenient for handling it, because of the ease in loading same.

The fodder may be placed in the silo either whole or cut, but for convenience of handling and feeding the silage it is usual to cut the fodder in short lengths, *i.e.*, to chaff it. For dealing with the thick hard stalks of maize and sorghum special silage cutters have been manufactured. These are very strongly made, and are of two types. One type is as shown in the illustration, and has the cutting knives placed around a circular frame and arranged lawn mower fashion, revolving against a cutting plate. On the other and new type the cutting knives are fixed to a vertical wheel, as in the usual chaffcutter. For cutting cereal crops like wheat and oats, the ordinary power chaffcutter is strong enough.

Silo lined with asbestos sheeting—33 feet high.

Note the continuous doorway and low wagon for carting the heavy material, the fodder (wheat) being cut with a chaffcutter and placed in the silo by means of the slatted elevator.

"Tower" silos are filled over the top, and because of their height it is necessary to have some mechanical means of filling them. Two methods are available—the slatted elevator, as shown in the illustration, and the air blast or blower. The later requires more power to drive it, but requires less space and is considerably more convenient. With the former, unless driven from the top with a very long belt or with an intermediate pulley, there is some risk that the sprocket chain carrying the slats over the bottom wheel will foul each time the elevator is started.

With modern machinery the silo can be filled in one or two days, if desired, but it is advisable to proceed more leisurely and to spend from four days to a week on the work. The slower rate of filling permits more fodder to be stored, as it will be found that the material will become more compact each day. Even with the slower rate of filling, a second, and even third filling may be necessary to ensure that the silo will contain its normal weight.

Whilst the material is being filled into the silo care should be taken to see that it is evenly distributed over the silo. This may be done by hanging a cone just below the discharging elevator or blower, or by discharging into a pipe the mouth of which extends near to the level of the material in the silo, and by means of which the inflowing fodder can be distributed where desired. Unless these precautions are taken it will be found that in the drop from the top to the lower levels the heavy material will become separated from the lighter and most of it be deposited in the centre of the silo, whilst the latter will reach the sides. This will result in uneven settlement and consequent waste. Whilst the filling is proceeding the material should be not only well spread, but also well packed by tramping, particularly near the walls. Because of the assistance which will be given by the weight of the upper layers to compact the lower these latter need not be tramped as much as the upper ones.

Section of filled "trench" or "clamp" silo ready for covering with earth from the sides.

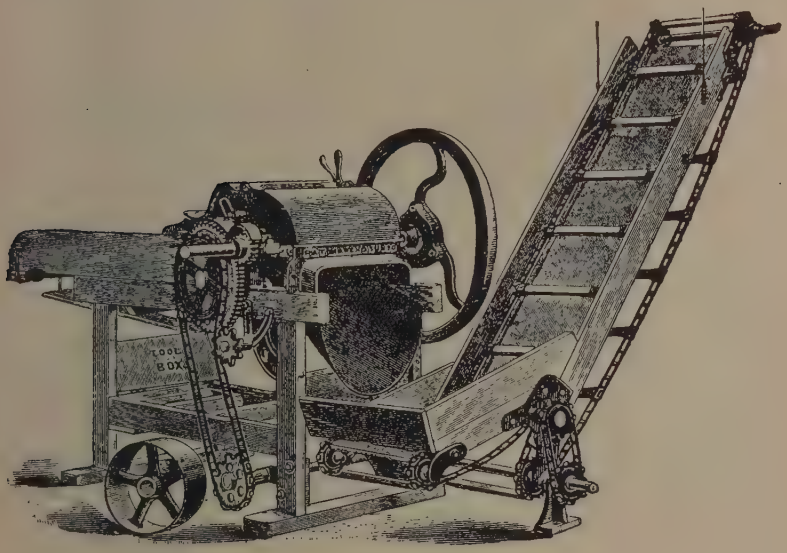
When the silo is finally filled after preliminary settlements, the top-most layer which is in contact with the air, if wet enough, will decay and form an airtight layer to protect the material beneath. It is essential that this protection be afforded, and King* suggests the application of 1½ to 2 gallons water to each square foot of surface so as to form an impervious layer by fermentation. This water can be added to the fodder as it is being chaffed. To save the waste of fodder the top may be covered with wetted chaffed straw, or other waste material.

At one time it was thought that the green fodder had to remain in the silo or stack for six or eight weeks until the fermentation period was over

* "Physics of Agriculture."

before it could be fed. This is not so. Though a period of about a fortnight is necessary for the fodder to acquire the characteristics of silage, the feeding out can commence at once or be delayed indefinitely. When the feeding out has commenced it may continue until the silo is empty, or, if only a part is fed, it can be covered again with straw, or with a cover formed from the decay of the surface layer, and left until required; it can also have fresh material placed on the top of it. Thus the material in the silo can be fed at any time, can be added to at any time, and, provided the air is excluded, it will keep indefinitely.

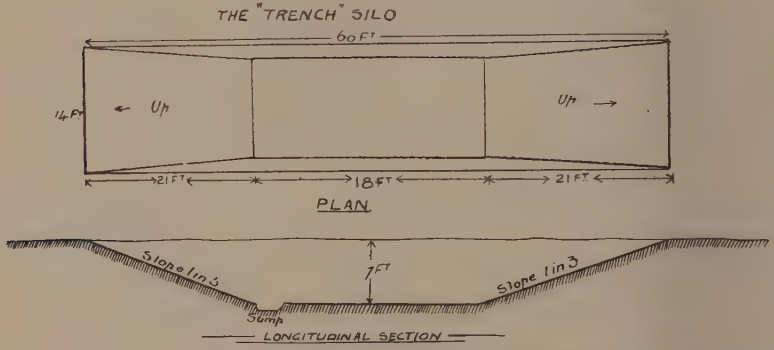
The easiest way, therefore, of feeding green fodder is through the silo. This is of very considerable economic importance to the farmer, for it enables him to leave his green crop until it has reached its maximum feeding value; it can then be handled in a wholesale and economical manner through the silo, thus leaving the land vacant for another crop.



Silage cutter with slatted elevator. Specially suited for Maize.

Except in the "trench" form, pit silos are rarely, if ever, constructed; they have been superseded by one or other of the above-ground types. This is not surprising, for it is obviously cheaper to enclose the necessary space above the ground than to excavate it at considerable cost before enclosing it. It may be argued that to offset this, there is less work and difficulty involved in filling the pit silo. This is so, but on considering this phase of the matter it has to be remembered that the silo has not only to be filled, but also to be emptied. In the case of the pit silo the filling may be done by gravity without labour; this is also the case with the emptying of the "tower" silo. The pit silo has, however, to be emptied by manual labour in a piecemeal fashion, and this is costly, whilst the filling of the tower silo is done in a wholesale way by power, and is comparatively cheap. The net advantage is, therefore, decidedly in favour of the tower silo.

The old pit silos were usually rectangular excavations from 10 to 12 feet deep, and lined with timber, bricks, stone or concrete; usually they were divided by a partition into two sections to prevent undue waste as the result of exposure of a vertical section, when the silage was being used. To prevent overheating the material was pressed with weights or a mechanical device. Excellent silage has been made in these with only a small amount of wastage; this was mainly in the angular corners, and on the surface.



From page 349, Vol. 1, September 1924.

The "trench" silo was first brought into prominence by Mr. John Gray, of Glencoe, Wee Waa, New South Wales, who exploited its usefulness for conserving native grasses and pasture plants. It is the modern successor of the old pit silo, and has the advantage that it can be constructed cheaply almost anywhere on the farm, and can, therefore, be used also to meet emergencies, if required.

This form of silo was fully described in this Journal by Mr. G. K. Baron-Hay,* and briefly it may be stated that a "trench" silo is a comparatively narrow excavation from 14 to 20 feet wide, and up to 12 feet deep. It is usually made with a plough and scoup, assisted with the pick and shovel, so as to have the sides almost vertical, and with as steep batters as are possible. The end batters are flatter, about 2½, or 3 to 1, so as to permit the vehicles loaded with the green fodder passing in and out. As they pass over the material whilst the silo is being filled they help to press and pack it. The material, which may be chaffed or unchaffed, is stacked several feet above the ground level, and then covered to a depth of nine to 12 inches with the earth taken from the sides. As the fodder settles cracks may develop in the earth covering, and if so, these should be filled up by adding fresh earth.

Stack silage is the most wasteful of all the methods adopted. This method, however, has the advantage that it can be made without capital expenditure, but even in this respect it has little advantage over that made in the "trench" silo.

Though good silage can be made in stacks, quite as good as in the best tower silo, the proportion of good silage to spoilt material on the sides and top is small.

* *Journal of Agriculture, W.A.*, September, 1924.

The excessive waste in a stack, and not common to other methods, is due to the loss consequent upon the exposure of the external surfaces to the air, and in consequence a considerable portion dries out and moulds, and becomes, in effect, very inferior hay which may even be injurious to stock because of the mould. The depth to which the destructive effect penetrates is largely influenced by the character of the material; with fine stemmed material like grass and other pasture plants the depth will range from 9 to 12 inches, but with coarser material like oats, wheat or maize, this will be exceeded and may reach 36 inches. The damaged material in the stack of oat silage illustrated herewith extended to this depth on the top and sides. This wastage has been calculated to equal in volume 56 per cent. of the total contents.

Commencing to fill a "trench" or "clamp" silo on property of Mr. Davis, Gnowangerup.

Very careful determinations were made regarding the wastage in a silage stack of grass and cover at the University Farm, Cambridge.*

> "Weighings of the amount of wastage by moulding on the roof, sides, and floor were made on 23rd September, and again on 8th December. On the former occasion the waste amounted to 29 per cent., and on the latter to 35 per cent., in addition to fermentation losses amounting to an average of 10 per cent. of the good silage remaining."

As the waste on a stack is due to the area exposed to the surface it is influenced by the shape of the stack, thus a square stack is less wasteful than a rectangular one, for there is less surface exposed to the air as the total length of all the sides of a square stack is shorter than that of the sides of a rectangular stack holding the same weight of silage.

*Amos, *Journal Min. of Agric.*, April, 1925 (32-1).

For the same reason a circular stack is less wasteful than a square one. Despite this, however, square and circular stacks are rarely built, and only in the small sizes, and when the stock are numerous enough to ensure that a complete surface layer at least two inches deep shall be required and removed daily. When this cannot be done the stack is fed in sections made by cutting off a portion across the narrow width of the stack. The cut surface of such a section is exposed to the air, and therefore subject to wastage; in the case of a circular or square stack it would be greater than in the case of a rectangular stack of the same volume, and would more than offset the initial saving. As one large stack is also more economical than several small ones, and because it is economical to feed stack silage in sections, it is, therefore, customary to build rectangular stacks with rounded corners, rather than several small square or circular ones.

The site selected for a silage stack should be well drained and levelled to obtain a good base. The stack can be built right on the ground, and requires neither a straddle nor layer of straw at the bottom. If dry straw or porous material is used at the bottom it tends to admit air, and the silage in contact with it is likely to become mouldy.

Silage stack at the Avondale State Farm, Beverley.
Note the position of the logs, which were 6 feet high when attached to the wires.

If, in order to secure proper drainage for the stack, it is necessary to raise the bottom of the stack above the surrounding country by means of a log straddle, the spaces between the logs should be filled in with clay or earth to prevent the admission of air to the bottom of the stack.

The dimensions of the stack should be as large as the crop to be conserved will justify. Suggested dimensions at the base for silage stacks are—

For 25 tons—4 yards x 4 yards, or 4½ yards diameter.
For 50 tons—4 yards x 8 yards.
For 100 tons—5 yards x 10 yards.
For 150 tons—7 yards x 12 yards.

The stack should be built as high as possible—18 feet or higher—for silage settles much more rapidly and to a greater extent than hay.

The green material, without drying or wilting, should be stacked in a similar way to hay, except that during the building of the first half of the stack the centre should be kept only very slightly "full," so that there will be no tendency for the material on the edges to slip off. In the building of the second half the centre can be raised considerably so as to assist in the shedding of rain water.

When building a silage stack it is advisable that the unloading from the vehicles should take place all around the stack, otherwise settlement is likely to take place unevenly, with a possible collapse of the stack. Should a stack show signs of undue settlement on one side a collapse can probably be averted by placing props against that side until the other side has settled to a similar extent.

The walls of the stack should be almost vertical, or very slightly drawn in to the top; overhanging eaves, as in hay stacks, are most undesirable and tend to wastage.

With stack silage there is such a tendency to overheating that the building of the stack should proceed as rapidly as possible; constant and regular packing by tramping should take place whilst the building is going on, and plenty of pressure should be applied as soon as the stacking of the material is completed.

Delay in building the stack or in applying pressure is likely to result in the inclusion or admission of excessive air with an unnecessarily high temperature. This will cause increased loss of dry matter, and a further decomposition of, and depression of, the digestibility of the protein constituents.

When the stack is completed the material should be compressed in any suitable way to keep out the air. A cheap and convenient method of compressing the stack is to place poles lengthways on the stack, and across these stretch a number of fencing wires to the ends of which are attached logs, fencing posts, or other heavy material. The logs, etc., should be suspended at least six feet from the ground. If the stack is to go through the rainy season it will be necessary to cover it so as to protect it from the rain.

Silage, however it may be made, differs from hay, principally in that it retains the *succulence* as well as the nutrients of the fodder from which it is made.

The principal differences between hay and silage may be contrasted as hereunder:—

Hay is dry.	Silage is succulent, and therefore *laxative* and more palatable.
Hay requires dry weather for perfect making.	Silage can be made in showery or any weather.
Hay can be burnt.	Silage cannot.
Hay cannot be made from some plants, *e.g.*, variegated thistles	Silage can be made from some plants unsuitable for hay.
Hay is subject to attacks from mice and other vermin.	Silage is practically safe from these attacks.
Hay preserves the weed seeds.	Silage has the weed seeds destroyed in it.
Hay is light.	Silage is heavy.

Because of the succulence it retains, silage more nearly resembles good pasture than any other conserved fodder. Good succulent pasture is recognised as the ideal basal ration for milking cows. Silage is, therefore, pre-eminently

adapted for use by the dairy farmer during periods of scarcity, or when pastures lose their succulence. Just as the fly wheel of an engine during periods when its power is not fully taxed stores up energy for use in time of stress, so the silo stores up succulent forage during periods of plenty for use during dry periods, and may, therefore, be termed the "Fly Wheel of the Dairy Farm."

Twin concrete "tower" silos at "Cuttening.

It must be emphasised, however, that silage is not a complete food in itself, and particularly for milking cows, as it contains too small a proportion of protein. This is the case even when the green fodder is a mixture containing legumes, owing to the breaking down of the true protein during ensilage. Feeding with silage should, therefore, be supplemented with a ration of clover or lucerne hay, or concentrates which will not only supply the necessary protein, but the dry feed which is also necessary. For a cow in milk a full ration of silage is 35 to 40 lbs.; to meet its protein deficiency this should be supplemented with about 10 lbs. of clover or lucerne hay, or its equivalent in concentrates, oilcake or bran, which are also rich in protein.

For sheep, silage is a formidable rival of hay, as a conserved fodder. If the hay can be fed in the long—unchaffed—state, it will be cheaper than silage. This is because hay in this State can be made as readily as silage,

with a minimum loss of nutrients, and can be stacked on cheap straddles in the open or in inexpensive open sheds, whereas the most economical method of making silage is in a "tower" silo, which involves a capital expenditure of from 40s. to 54s. per ton capacity, as well as additional expenditure for the filling plant.

The interest and depreciation on the capital expenditure involved adds to the working expenses connected with the conservation of green fodder as silage, as does also the handling and carting of the extra weight of green material. Assuming that the extra cost amounts to 18s. for the equivalent of one ton of hay (say three tons of silage), then the cost of providing sheep with 2lbs. of succulent silage per day as part of their ration for three months will cost sixpence (6d.) per head more for that period than if the sheep were given an equivalent amount of dry hay per day, say ⅔ lb. If, however, the conditions of a particular farm require that the hay shall be chaffed, then it is believed that succulent silage will be cheaper to feed than dry chaffed hay, for the added cost of chaff-cutting and bagging will more than off-set the additional charges associated with the production of silage, and already referred to.

Silage, because of its succulence, which causes it to be laxative, has a special value as part of the ration for lambing ewes when on dry feed, and in consequence the feeding of silage to such stock is probably justified, even if the extra cost be involved.

SUMMARY.

Silage-making is of great antiquity, and was introduced into Western Australia at the beginning of the present century.

Silage provides a means of conserving fodder in a succulent condition. It is excellent for dairy cows, useful for sheep and horses, and, to a limited extent, also for pigs.

The green fodder is preserved in consequence of the exhaustion of the oxygen in the air within the mass.

The primary and essential causes of the changes during ensilage are the respiratory action of the plant cells whilst living, and enzyme activity before and after their death; other subsidiary and non-essential changes may occur, and are due to bacterial activity. The charges are accompanied by considerable self-heating, which results in the loss of dry matter, principally carbohydrates, and also in the decomposition of portion of the true protein. The products which result from the decomposition of the protein are not lost, but cannot be utilised for the building and repair processes for which the true protein is alone suitable. The resulting nitrogenous compounds are, therefore, less valuable as food than the protein from which they are derived. The changes which take place hinder the development of moulds and prevent decay, and so silage will keep good as food for a long time.

All kinds of silage have a sour taste, some have also a more or less pronounced acid smell, and some an objectionable aroma. This is due to the formation of organic acids during ensilage and consequent upon the partial oxidation of the dry matter. The principal acids formed are acetic and lactic acids. If the former predominate the silage will have an acid smell, and be known as "acid" silage; if the latter are in excess the distinctly acid smell will be absent, and such silage is known as "sweet" silage. An unpleasant aroma is due to the presence of butyric acid, and is an indication that the silage is partially spoilt.

The different forms of silage have been classified as "sweet," "acid brown," "green fruity," "sour," and "musty" silage.

The last two are defective. "Green fruity" and "acid brown" are the best, and are made as the result of ensiling the crops at the proper state of maturity, and maintaining comparatively low temperatures below 100° F. "Sweet" silage is produced when the higher temperatures of 113° F. to 122° F. are reached.

Even when the comparatively high temperatures associated with the production of "sweet" silage are reached, the total loss of dry matter need not be excessive. It is probable that in well made silage the loss of nutrients does not exceed that which occurs in well made hay.

As the decomposition of portion of the true protein is unavoidable during ensilage, and such does occur to the same extent in well-made hay, it follows that unless there are very special reasons for doing otherwise leguminous crops like lucerne, clover, peas, etc., which are specially rich in protein, and which are usually grown to supply farm protein deficiencies, should be made into hay rather than into silage.

To make good silage the plants must be harvested at the proper stage of maturity, *i.e.*, when they contain not less than 66 per cent. of water, nor more than 74 per cent., and **air excluded** from the mass by packing and pressure in order to keep the temperature as low as possible.

Good silage can be made from many plants, including native grasses and pasture plants. On farms it is usually made from cultivated crops, as the winter cereals, and maize, sorghum, and Sudan grass. The cereals should be cut when in flower, and the maize when dented.

Rape and other plants belonging to the cabbage family are considered unsuitable for silage.

Silage can be made in silos, above or below the ground, and in stacks. Above ground or "tower" silos should be circular and deep, have smooth rigid walls, and be fitted with an almost continuous doorway. "Pit," or below ground silos are giving place to the "tower" silo. The "trench" silo is the modern successor of the old pit silo, and consists of a narrow excavation made largely with plough and scoop.

Stack silage is the most wasteful of all methods, owing to the large amount of spoiling which takes place on the sides and top.

Silos should be emptied by removing the whole of the surface daily; experience has shown that not less than 1¼ inches, and preferably 2 inches, should be removed daily. The diameter or surface dimensions of the silo are, therefore, governed by the number of stock to be fed. The depth is determined by the period during which the silage is required to be fed.

The silo provides the easiest way of feeding green fodder; the material can be fed to stock as soon as placed in the silo, or at any time afterwards. It can be added to at any time, and will keep indefinitely.

Because of its succulence, silage is an excellent substitute for good pasture, and is, therefore, pre-eminent as a conserved fodder for milking cows. It may be regarded as "The Fly Wheel of the Dairy Farm."

For sheep, silage is a formidable rival of hay. It is slightly more costly to produce than long hay, and less costly than chaffed hay. Because of its succulence its use—even at a slightly higher cost—is probably justified, particularly for lambing ewes.

CONTAGIOUS ABORTION OF CATTLE.

H. W. Bennetts, M.V.Sc.,
Veterinary Pathologist.

Cows "slip" their calves from different causes, but though accidental abortions may occur the great majority are of contagious character.

Cause.—The most common cause of such contagious abortions is a very minute germ or organism known as the Bacillus abortus; and where successive abortions occur in a herd this organism is almost certainly responsible.

"For practical purposes, the only safe rule is to assume that every case of abortion is of the contagious variety," until a definite diagnosis can be arrived at. This, as we shall see later, can be made by means of a blood test.

Distribution.—The occurrence of this disease appears to be almost world-wide, and it is widely distributed in Australia. Its existence in this State has been proved, but the extent of the distribution here has so far not been determined.

Methods of infection.—The ultimate source of infection is an affected animal. Cattle are most commonly affected by eating pasture, fodder litter, etc., *recently* contaminated with infective material. Such infective material, which contains the causal organism, consists of discharges from the womb of an infected cow following abortion or calving (the discharge may persist for up to 40 days after abortion), and in the aborted foetus (slink) and foetal membranes (afterbirth). The organism (B. abortus) will remain alive for a time outside the animal body if protected from the drying and sterilizing action of sunlight, but contamination of pastures does not persist for any length of time. Recent contamination is by far the most dangerous.

Which cows carry the infection? There are three classes of cow which harbour the organism (B. abortus)—

1. Cows which abort.
2. Cows which, though infected, do not abort.
3. Cows which have apparently recovered.

It is important to remember that all cows which are infected do not abort; that a cow may, as often happens, abort on one or two occasions, and then not at any subsequent calving, but that *cows belonging to Classes* 2 *and* 3 *are usually permanently infected, and may act as spreaders of the infection in the same way as does an aborting cow.*

Apart from the discharge from the womb and the foetal membranes voided from the three classes of cow mentioned above, there are still other possible sources of infection. Milk from affected cows contain the organism, as does the dung of newly-born calves. These are not very probably sources of infection.

Bulls may also become affected by eating the same infective material as cows, or by serving a cow which has recently aborted. These bulls, apparently, may sometimes infect other cows during service.

Location of Bacillus abortus in the body.—Following infection, where does the germ go to? Its favourite home in the body of the cow is the udder, which is also the habitat in non-pregnant animals. During pregnancy the

womb is invaded, and abortion may result. No matter how the organism gains access to the body these are the sites it attacks. The health of the animal is not detrimentally affected. The udder remains apparently normal, and the milk appears unchanged. The presence of the germ can only be satisfactorily determined by laboratory methods. The only apparent ill effect produced by the germ is that by its invasion of the pregnant uterus (womb) it may produce abortion sometimes followed by temporary or complete sterility of the cow concerned. The Bacillus abortus disappears in due course from the uterus until a subsequent pregnancy, meantime living in the udder.

Cows which have aborted once may abort a second time, or even a third time, but very rarely again, although they harbour the germ and void it in vaginal discharges, and are a source of danger to the other cows in a herd. The cows infected acquire a tolerance to the germ, and if infection is wide spread in the herd the number of abortions gradually decreases, though of course, young or new stock introduced to the herd may become infected, and many of these abort.

Diagnosis.—It is possible by means of a blood test ("Agglutination test") applied in the laboratory to determine with almost absolute certainty which animals in a herd are harbouring the organism of contagious abortion. This test is being performed at the Veterinary Pathological Laboratory attached to the Department of Agriculture. The details of the test do not concern us here, but a few directions as to the collection of blood samples for testing will not be amiss. Nick one of the blood vessels of the back of the ear (they can easily be seen just under the skin), and leaving the ear free allow the blood to drip into a small, *perfectly clean dry bottle* until half an ounce of blood is obtained. Cork, number for identification, and despatch as soon as possible to the laboratory. Only fresh blood is suitable for testing. In addition to the agglutination test microscopic and cultural methods of diagnosis are available (from discharge, foetal membranes, etc.).

Treatment.—Many lines of treatment have been tried, but none has proved to be of any great value. In an affected herd attention is, therefore, to be directed to the methods of prevention and control.

Prevention and Control.—The preliminary step is to determine the degree of infection in a herd by submitting blood samples from the entire herd (including the bull) to the agglutination test. The subsequent steps recommended depend largely on the existing conditions and on the percentage of animals infected. It is possible to keep a clean herd free from infection by introducing new purchases only subject to their passing the agglutination test. A further test should be applied six weeks after the first one, and if a negative reaction is again obtained there is very little possibility of infection being introduced. Any positive reactors to the test should be excluded. In addition it is necessary that no strange cows be brought on to the property for service to the herd bulls or for other purposes, and none of the herd cows sent to outside bulls.

In an infected herd the means of control adopted depend very largely on the percentage of cows affected. If only a few cows have the disease it is best to dispose of those for slaughter, and to build up a clean herd by taking repeated agglutination tests, eliminating any further reactors, and disinfecting premises.

If a large percentage of the herd is affected it pays to keep cows which have aborted, as these are not so likely to abort again. New heifers and cows introduced into the herd should be kept completely isolated, at all times, from the infected herd.

Summary.

1. Most cases of abortion are of a contagious nature, and are due to the Bacillus abortus.

2. Infection is spread mainly by discharges (and afterbirths) from affected cows after calving or abortion.

3. Infected cows remain, usually, permanent sources of infection.

4. Diagnosis is based mainly on the agglutination test, whereby the degree of infection in a herd can be determined.

5. Treatment is unsatisfactory.

6. Methods of prevention and control are the only means of combating the trouble. The means of control to be adopted can only be determined by qualified advice.

Further particulars may be had on application, and blood samples may be sent to the Department of Agriculture Perth, for submitting to the agglutination test.

WOOL CLIP STATISTICS.

The following statement, compiled by the National Council of Wool Selling Brokers of Australia, covers the receipts of the 1926-27 clip into store, the total disposals up to the end of December, and the balances in each centre then awaiting sale:—

Selling Centre.	Receipts.	Disposals.	Balance in Store.
	bales.	bales.	bales
Sydney	1,044,407	551,986	492,621
Brisbane	200,297	130,069	70,228
Victoria	580,353	306,655	273,698
Adelaide	227,947	145,540	82,407
Western Australia	129,123	75,389	53,734
Tasmania	29,086	3,193	25,893
Totals	2,211,413	1,212,832	998,581

W.A. WOOL STATISTICS.

Wool received into store in Western Australia from 1st July, 1926, to 31st January, 1927, by all brokers, aggregated 134,284 bales, of which 99,410 bales have been sold at auction in Perth, 3,534 bales have been shipped to London, and 31,340 bales are in brokers' stores awaiting sale.

REGULATIONS GOVERNING THE EXPORT OF FRESH FRUIT.

GEO. W. WICKENS,
Superintendent of Horticulture.

Amendments to the regulations governing the export of fresh fruit from Australia, given hereunder, are of great interest to the many apple and pear shippers in this State. The amendment dealing with the size of the fruit is a most important one. In the old regulations a variation of one-eighth of an inch above or below the size branded on the case was permissible; now no apple or pear in a case must be under the stated size.

There has been a decided tendency in recent years for some exporters to make the most of the one-eighth inch allowance, and cases branded as containing 2½in. and 2¼in. apples have often had very few which really went the full measurements. This season, if the fruit is found to be under the size stated, the cases will have to be branded with the correct size at the ports of shipment, and this will mean considerable extra expense to be borne by the grower.

Another very bad feature of wrong branding will be that sold fruit, which this year promises to be about 70 per cent. of total shipments, has been bought by the agents to fill orders in which the size of the fruit has been definitely stated, and if fruit sold as 2½in. has to be rebranded at the port as 2¼in., some interesting and unpleasant complications are bound to ensue. The complete amendments to be enforced this season are as follow:—

STATUTORY RULES.

(1927 No. 11.)

Regulations under "The Customs Act, 1901-1925," *and "The Commerce (Trade Descriptions)* Act, 1905-1926.

I, the Governor General in and over the Commonwealth of Australia, acting with the advice of the Federal Executive Council, hereby make the following regulations under "The Customs Act, 1901-1925," and "The Commerce (Trade Descriptions) Act, 1905-1926, to come into operation forthwith.

Dated this 7th day of February, 1927.

STONEHAVEN,
Governor General.

By His Excellency's Command,

T. PATERSON,
for Minister of State for Trade and Customs.

———

Amendment of the Commerce (General Exports) Regulations.

(Statutory Rules, 1926, No. 22, as amended to this date.)

1. Regulation 46 of the Commerce (General Exports) Regulations is amended by omitting the words "or has been in contact with fruit so affected, or has been produced in any orchard where San José Scale is present."

2. Regulation 48 of the Commerce (General Exports) Regulations is amended—

(a) by omitting from paragraph (b) the words "limb rubs and sprays," and inserting in their stead the words "or limb rubs";

(b) by omitting from paragraph (c) the words "apples or pears described as "standard" shall consist of sound, clean, well-formed apples or pears of one size and one variety, free from broken skins and from serious blemishes, but fruit slightly blemished by rubbing, black spot fungus, or caterpillars may be exported, provided that," and inserting in their stead the following words:—"apples or pears described as 'standard' shall consist of sound, clean, well-formed apples or pears of one size and one variety, free from broken skins and not seriously blemished or injured by any disease; but fruit slightly blemished by black spot fungus caterpillars, hail marks or limb rubs may be exported provided that";

(c) and by omitting paragraph (d), and inserting in its stead the following paragraph:—

(d) Apples or pears described as "plain" shall consist of apples or pears of one size and one variety, free from broken skins and not seriously blemished or injured by any disease; but fruit slightly blemished by black spot fungus, caterpillars, hail marks or limb rubs may be exported, provided that the total area covered by such blemishes on any apple or pear does not exceed the area contained in a circle having a diameter of half an inch. Russetting of the surface shall not be deemed to be a blemish if the skin is unbroken. The diameter of apples shall not in any case be less than two inches.

3. Regulation 61 of the Commerce (General Exports) Regulations is amended—

(a) by inserting at the end of paragraph (a) thereof the following provisos:—

Provided that the size of the apples or pears appearing in the trade description shall be stated as follows:—

"2 inches," which term shall include fruit of two inches or greater diameter, but less than 2¼ inches.

"2¼ inches," which term shall include fruit of 2¼ inches or greater diameter, but less than 2½ inches.

"2½ inches," which term shall include fruit of 2½ inches or greater diameter, but less than 2¾ inches.

"2¾ inches," which term shall include fruit of 2¾ inches or greater diameter, but less than 3 inches.

"3 inches," which term shall include fruit of 3 inches or greater diameter, but less than 3¼ inches; and

"3¼ inches," which term shall include fruit of 3¼ inches or greater diameter.

Provided further that in no case shall any apples or pears be less than the minimum size prescribed in Regulation 48 for each of the grades mentioned; and

(b) by omitting the provisos at the end of paragraph (b) thereof.

4. Regulation 61 (1) of the Commerce (General Exports) Regulations is renumbered "61a."

Interior view of Valencia Wine Cellars : Casks filled ready for shipment.

Wine being transported from Valencia Cellars to Railway.

VITICULTURAL DEVELOPMENT.

FIRST BULK EXPORT OF WINE.

H. K. Johns,
Viticulturist.

The year 1926 will be a notable one in the history of viticulture in Western Australia, owing to the great forward movement made in the industry as the result of the success which attended the recent first big shipment of wine from this State to the English market, in competition with the product from the famous wine-producing countries of the world. For the past 30 years some of the Eastern States have been exporting wines to England, which until recently have been chiefly of the full-bodied dry red type. Various parts of South Australia, and more especially the North-Eastern portion of Victoria districts, have been shipping these wines, which have compared favourably with similar types produced on the continent (France). I may here mention that this State has vast areas of land, which, undoubtedly, will produce enormous gallons of the above type. In order to find an outlet for the over-production of fresh grapes and grapes of drying quality, and the increased production of wine, largely assisted by the introduction of the most modern wine-making machinery, the Commonwealth Government decided to give a bounty on sweet wines, for the purpose of giving stimulus to the export trade, the result of which has been to relieve the small grower of his surplus production of fresh grapes of drying varieties, through channels of distillation, while the development of the sweet wine trade on the Empire markets has enormously increased during the past 12 months.

The quantity of Australian wine imported into Great Britain alone for the year 1926 amounted to 1,755,000 gallons, compared with 1,028,000 gallons for the year 1925 and 824,000 gallons in 1924. It will, therefore, be noticed the remarkable development which has taken place, being an increase of about 1,000,000 gallons in two years. The consumption of Australian wine in Great Britain shows a marked increase; for the year 1926 the quantity being 1,415,000 gallons; in 1925, 782,000 gallons; and 1924, 611,000 gallons, an increase of a little over 800,000 gallons in two years. The total value of Australian import wine to Great Britain in 1926 has returned just on £370,000.

With a view to still further developing the Australian wine trade in Great Britain, the Commonwealth Government has now decided to renew the export bounty on sweet wines for a period which to date has not been definitely announced. This announcement is being anxiously looked forward to by viticulturists in every wine-producing State.

Although Western Australia has been producing wines for many years, its development has been of a somewhat negligible quantity as compared with the great strides made by the other wine-producing States of Australia, but it is decidedly encouraging to be able to say that if our immense area of land and natural conditions, favourable to the production of wine of a suitable export quality, are utilised upon sound cultural, scientific methods, Western Australia should become one of the leading wine-producing States of the Commonwealth. If suitable varieties of wine grapes were available

Loading Western Australian Wine on s.s. "Surrey."

S.S. "Surrey," which took the first big consignment of Western Australian Wine to England.

in the State to-day, the demand for them would be practically unlimited. The Valencia Vineyard Company, in the Swan district, is deserving of the highest praise for its vigorous and commercial enterprise demonstrating in a practical manner the great possibilities ahead of this State in the viticultural industry, by having successfully pioneered the way in opening a big export wine trade as the result of its bulk experimental shipment, totalling about 22,000 gallons, the whole of which was purchased by Messrs. Pownall & Bageneal, Emu Wines, London.

Advice is to hand that the early consignments arrived at their destination, and have been very favourably commented upon by connoisseurs as being useful and satisfactory wines for the requirements of the English trade. The Valencia Vineyards, it may be mentioned, was previously owned and conducted for a number of years by the Santa-Rosa Company, but taken over some time ago by the former company, who secured the services of Mr. J. W. Wilson as general manager, recognised as one of the most energetic and successful viticulturists, having years of experience in every branch of the industry and with the largest commercial firms in the other States. It is largly due to his foresight and intimate knowledge of the wine industry and its export trade requirements, that Western Australia has now been placed in the forefront with the other wine-producing States of the Commonwealth. It is of the greatest commercial importance from a State's standpoint that wine in such large bulk lots has stood the strict and critical tests applied to all wine for export, the officers appointed to examine the wine on behalf of the Commonwealth Government declaring it to be of a very marketable and wholesale quality of a full type known as "Ruby Red Sweet." I may mention again here, that in my opinion this is a variety of wine which Western Australia is well adapted to produce, and in large quantities.

The Commonwealth Excise Department was also very strict and rigid in its examination, as no sweet wine under the Bounty Act is permitted to be exported containing under 34 per cent. proof spirit. Such spirit used in fortification must be obtained from general distillers who have paid up to standard price per ton for their Doradilla grapes previous to distillation, of which the Excise Department have a list of all those distillers. This applies to vignerons intending to export only under the Bounty Act, therefore, no bounty can be obtained unless the general distilling firms in the Eastern States are paying a set price for Doradilla grapes, the object of this is to relieve the Doradilla grower who has extensively planted that variety, but which is of no commercial value for wine-making, nor as fresh or dried fruit, because its place has been taken by more suitable varieties. The Bounty Act has therefore relieved the unfortunate position for those growers.

The whole of the spirit used in the recent bulk shipment of export wine from Western Australia complied with the Commonwealth Bounty Act, so that this State has in no small degree helped to relieve the position of the over-planted Doradilla grower of the Eastern States. The important advance now made in the wine industry of our own State should also pave the way for a large distillery here, provided the Commonwealth Government would allow bounty to be collected on the distillate from the fresh and dried grapes surplus, and thereby safeguard our supplies and prices for fortifying spirit instead of having to depend upon the Eastern States, as at present, with all the increased cost of handling charges and freight to handicap the industry here.

For the information of growers, I may point out that the bounty (four shillings per gallon) paid by the Commonwealth Government on sweet wines is practically repaid many times over by the sweet wine maker himself, so that the Bounty Act is not, as most people might suppose, a tax upon the community. For instance, during the last four years the Commonwealth Government has received £2,117,000 as excise duty on fortifying spirit—grape brandy; on the other hand the wine industry has contributed £3 to the revenue of the country for every £1 paid in bounty. The wine industry has, therefore, provided a unique experience as, instead of asking for charity, it is deserving of every consideration on account of its becoming the natural and wholesome beverage of the British Empire.

SELECTING FAT SHEEP FOR MARKET.

HUGH MCCALLUM,

Sheep and Wool Inspector.

The selection of fat sheep and lambs is no doubt a difficult matter, especially to the inexperienced man in sheep raising, and he must often be disappointed with the results of his so-called fats. To the experienced grower it is not difficult to draft fats for the market. The beginner should realise first the general appearance of the sheep, which to a very large extent tells whether it is fat or otherwise. Then, after having taken a general look, the selector proceeds to handle the sheep over the loin and along the ribs. Following this he generally takes hold of the tail; if a sheep's loin is well covered it will carry a good kidney when killed—that is, a kidney that is well covered with fat, which usually affects the weight of the sheep to the extent of several pounds. It is very rarely that a sheep with what is known as a plain loin will kill well, although it may often have a good fat tail. The sheep with a good loin will handle very solid on the back and across the hip bones. If the sheep's hip bones project in any way when handled, it cannot possibly be classed as prime. When the ribs of a fat sheep are well covered, as they ought to be, it will be difficult to feel each individual rib. The practice of fattening store sheep on the farms is becoming more general than hitherto.

THE WOOL SALES.

H. McCallum, Sheep and Wool Inspector.

The wool sales on the 22nd February must have been satisfactory to a large number of growers. The soundness of the wool position was demonstrated with the excellent clearances of all lines. There does not appear to be any possibility of values receding; the price of merino wools, as far as production is concerned, is practically dominated from Australia. The spirited competition of the sales is the outcome of established confidence. Western Australian wools are bought and shipped to all parts of the world, and each year this is bringing them into prominence.

CAREFUL PREPARATION NEEDED.

More careful skirting and classing of the largest to the smallest clips must be exercised. The cost of re-classing and re-sorting consignments by manufacturers, which have been carelessly classed, is so great that every effort must be made by growers to render every assistance in this direction. At the shearing shed this work can be done expeditiously and at little cost to the grower. The great improvement made in this respect during recent years by many growers is having good effect on others, and no greater reflex of the improvement that has taken place in the preparation of the clips can be found than in the number of small growers' lots of wool that can be grouped under the interlotting system adopted by the wool brokers with such advantage, when the classing is carefully done. Many growers are still neglectful in their classing; why, it is hard to state. They suffer for their negligence.

The interlotting of so many clips during the past and previous sales, combined with the prices realised, was an outstanding feature. Does this not indicate to every farmer that, provided he uses the right class of sheep, and handles his small clip in the right manner, he is on exactly the same footing as the larger grower? The buyers are very keen on big lines of even quality wool, and when opportunities are offered to secure a big parcel they bid freely.

PASTURE ONLY HIGH CLASS SHEEP.

To obtain good prices for wool good sheep are necessary. Every farmer should keep sheep on the farm where possible, as there is always a certain reserve of feed on the uncultivated paddock, also the stubble after the harvest has been gathered, and there is fallow to keep clean; all this is a valuable asset when handled in the right way.

Many farmers still continue to purchase inferior sheep. The wool from such sheep does not bring satisfactory prices to the grower. They do not give the returns for wool or mutton compared with stock bred on the right lines. It is obvious that the farmer who received 18d. or 22d. per lb. for his wool is better off than the grower who receives only 13d. or 14d. Most of the farmers have good flocks; they purchase their ewes from good breeders; they pay a little extra for a class of sheep that will give a good wool return irre-

spective of whether it goes into the bale or is bought for the skin and carcase. It is not only desirable but of the greatest importance that the sheep and wool industry should be maintained at the highest standard of productiveness in Western Australia.

INCREASING INTEREST IN WOOL.

Judging from the increasing number of growers who visit the wool stores prior to the sales, farmers are taking advantage of the opportunity to improve their knowledge in regard to wool qualities and the preparation of the clips for sale. With the various grades of wool displayed together on the floors of the wool stores no finer object lesson could be provided, as the opportunity is given for making close comparison with the different clips displayed. The wool brokers welcome at all times visitors from the country to inspect the clips. Their experts impart knowledge that is of great value to wool growers in the general "get up" of the clips. Those who have not inspected a show floor before a sale I would advise to do so; they are well worth seeing. Throughout the State there is a big demand for only the best sheep possible, and the prices obtained by the farmers for their wool at the last sale is their reward for keeping only the best possible on the wheat farm.

"ALLEGRO"

SAFETY RAZOR BLADE SHARPENER.

New model with solid hone and leather strop

PRICE—30/- Postage 6d. extra

State style of blade for which required.

A. L. TILLY, CHEMIST, PERTH.

1—4

POTATO CHIPS.

G. N. Lowe,
Senior Potato Inspector.

SUCCESS OF CERTIFIED SEED IN SOUTH-WEST.

An outstanding feature in the last potato crop in the South-West, particularly in the Bunbury district, was the marked success of the seed bearing the certificate of this Branch. In all, about three trucks of this class of seed from Young's Siding, on the Denmark line, was disposed of in the Bunbury area, and any growers fortunate enough to obtain supplies were delighted with the results, particularly when tested against the local strain.

One instance will be sufficient (although numbers might be quoted) to indicate how well this seed yielded in a season which generally from a standpoint of heavy yields was one of the worst on record, owing to the extreme wet.

A grower at South Bunbury planted five bags of certified seed for a return of 130 bags, whilst one bag of swamp-grown of local strain in the same crop only yielded four bags.

It must be admitted, however, that the single bag was not of any particular value as seed, although grown in a swamp noted for years as producing a valuable change for seed purposes.

(For "Potato Chips.")
Potatoes of this size are, of course, cumbersome to handle and rather too large for culinary purposes.

Because of the success of this certified seed, growers must not run away with the idea that any potatoes from the Great Southern district will give equal results, as unfortunately there is probably just as much poor stuff sold as seed from that area as from the South-West. Freedom from apparent disease does not constitute the whole and only desirable quality in tubers for reproducing a heavy crop, and growers are, therefore, strongly advised to obtain seed which has come under the supervision of the Potato Branch during growth and harvesting.

FLOODS ON THE DENMARK LINE.

It is most regrettable that numerous crops along the Denmark line, which would have been available for use as seed in the next July crop in the South-West, were recently practically ruined through floods. With a fall of seven inches in two days these crops, then looking excellent, went under water, and except in odd patches could not survive. Fortunately some crops escaped and will return good yields, and are the original strain of Delaware which came from the State Farm, Brunswick, some nine years ago, and which growers in the Denmark area have taken such care of since.

WHEN INQUIRING FOR SEED.

It is of course not remarkable that the Potato Branch receives great numbers of inquiries with reference to the selection of seed potatoes for prospective growers or requiring information as to where such may be obtained. What is quite remarkable, however, is the number of times that such inquiries are only forwarded immediately before the period of planting.

A crop of "Delaware," grown under irrigation by Mr. J. Jeweller of Hamel.

Officers of the Branch are always keen to help in the matter of the choosing of seed for growers (who, however, would be much better off with a special "stud" plot of their own), but would appreciate such requests being made some weeks ahead, if possible, so that supplies may be located preferably in a growing crop where the desirability of such as seed is best indicated. Disappointment may quite easily arise from merely "good looking" seed, which has no reproductive strain behind it, being planted, and often such seed only is obtainable when the grower leaves so late the business of filling his needs in this direction.

WET BAG TREATMENT FOR CUT SEED.

A further indication of the value of cutting seed into wet bags from 24 to 48 hours prior to planting, to ensure a proper germination in the summer, has just been afforded in a small test plot on the property of Mr. J. Brighton, Elleker.

Mr. Brighton, who is a particularly keen and energetic grower, has to date had such poor germination with Delaware, particularly when such were cut, that he had given up cutting this variety when planting.

It was decided to make a trial of the wet bag treatment as against cutting seed as is ordinarily done, and to use whole seed as the "control."

A record of the germination of the three methods has just been taken, and this shows that the average of the "controls" was 90.3 per cent., whilst in the case of the untreated cut seed 72.8 per cent. of the plants showed above ground. The results in the case of the treated seed, however, were excellent, as the germination percentage was 96.6.

A similar trial, but on a larger scale, has been planted in Benger Swamp, and from the results of this it is hoped that it will be possible to state definitely whether this treatment of cut seed for summer planting may be safely and generally adopted.

THE SPARROW.

C. J. CRAIG.

The House Sparrow (*Passer domesticus*) is found in most countries of the world and where Nature had mercifully omitted it from the programme, as, for instance, Australia and New Zealand, man had the dubious honour of introducing it and marring the work of farming and fruit-growing to an extent which the present generation has no difficulty in recognising, and for which it duly blames the judgment of the pioneers.

The sparrow is an interesting bird in spite of, or perhaps by reason of, its power for evil. Not the least difficult in the way of its repression is its remarkable indifference to extremes of temperature, it being equally impudent and aggressive during the heat of Queensland summer as in the snows of English winter. A pest to Egyptian grain dealers in the days of the Pharoahs, it passed in that country as the symbol of lust, whilst they are recorded on at least two occasions in Holy Writ. Frederick the Great, who combined a taste for farming with his military genius, once called his advisers to arrange for the extermination of the sparrow. Frederick could subdue nations but found the little brown birds successfully resist the German efforts—and without American assistance.

A legend of the Greek Church maintained that, whilst other birds remained aloof, the chirping of the sparrows guided the Jewish band to the whereabouts of Our Lord and his disciples in the Garden by Cedron when he was seized to be taken before the High Priest.

In this State, fortunately, we are free from a pest that exacts a very heavy toll from both the farmer and the orchardist.

Captain White, a prominent South Australian Ornithologist, estimated that the birds caused damage to the extent of £100,000 per annum in that State alone.

The sparrow usually raises three broods in the season, laying from four to six eggs of a faint blue colour thickly mottled with brown; though, as in the case of the magpie, the colour may vary very greatly. One thing is certain, that if once they become established, extirpation is impossible, and as prevention is much better than cure this department has arranged for supervision to be exercised over the two routes considered to be most favourable for their spread westward, that is along the south coast, *via* Eucla, and along the transcontinental line. A few birds and even nests and eggs have been obtained by railway officials in trucks and vans well on the way to this State.

The recent "Carinthia" incident, when some people, possessing big hearts and a dearth of understanding, liberated a pair of sparrows at Fremantle, serves to illustrate the necessity of a careful watch being maintained to prevent the entrance of a pest which would prove almost as great an economic disaster as the introduction of the rabbit and the fox.

In the Eastern States Sparrow Clubs are formed and offer bonuses for their destruction. At agricultural shows prizes are awarded for the greatest number of sparrow eggs and heads.

The gun, loaded with dust shot, is of use in dealing with small colonies, but the laying of poisoned grain is easily the most effective means of reducing their numbers. As the birds are exceptionally wary and suspicious, clean wheat should be laid night and morning for a day or two, and when it is seen that this is taken freely, poison may be added with invariably excellent results.

HORTICULTURAL NOTES.

Geo. W. Wickens,
Superintendent of Horticulture.

SEASONAL WORK FOR APRIL, MAY AND JUNE.

April.

Though autumn tints appear on the early kinds of deciduous trees before the end of the month, fruit harvesting operations are still in full swing in the apple and pear districts, and while the pear crop has been below the average the apple crop has been well above, with the rare occurrence of a record crop synchronising with a strong demand and good prices, making the season of 1927 a welcome change from the disabilities which beset marketing conditions last year.

Those who sold f.o.r. at growers' sidings did so much better last year than those who shipped on their own account, that it is not surprising to find that more purchased fruit is being exported this year than at any time previously, and prices paid have been very satisfactory to producers.

Some of the later varieties will be gathered before the end of this month and placed in cold storage for local market requirements, and anyone who is storing "Granny Smiths" with the intention of holding them until September, or later, is strongly advised to use prepared oiled wraps to prevent apple scald.

In districts where Fruit Fly is in evidence baiting and trapping should be continued, and every care taken to clear the trees of the last fruits, particularly second crop pears, which often hang on the trees until early winter, and carry the flies along until the oranges are ripe enough to be attacked.

In orchards where citrus Brown Rot was experienced last season citrus trees should be sprayed to a height of four to five feet from the ground, together with the land under, and extending for a foot or more outside the spread of the branches. Use Bordeaux at a strength of 4lbs. bluestone, 4lbs. freshly burned lime to 50 gallons of water; or Burgundy at a strength of 4lbs. bluestone, 6lbs. washing soda, 50 gallons of water. The trees should not be sprayed all over, or the beneficial fungi which attack lecanium scales will be destroyed, and these pests will increase with great rapidity.

Apply fertilisers this month, and particularly when the trees are bearing and have carired good crops use liberal quantities: 6 cwt. of superphosphate, 3 cwt. muriate of potash per acre with 1½ bushels of peas sown in April and ploughed under in spring will keep the trees in heart, and enable them to produce an equally good crop next season.

Thoroughly prepare the ground this month when new orchards are to be planted, subsoil so that the land is moved to a depth of 12in. or more and follow up and entirely remove all roots of native trees.

May.

Pruning will now claim the attention of growers of stone fruits, particularly in the early districts near Perth, where most varieties of apricots, plums and peaches will have shed their foliage. Where varieties of peaches liable to shed their buds (Briggs, Hales, Downing, Alexander, etc.) are grown, it is advisable to delay pruning until the buds have burst in early spring.

Spray deciduous orchards for the control of San José as soon as the leaves have fallen, using commercial lime sulphur at a strength of one gallon in seven gallons of water, or a reliable brand of spraying oil may be substituted for lime sulphur, using one gallon of oil in 19 gallons of water. To keep San José Scale in check it is necessary to spray twice while the trees are dormant: the first to be applied as early as possible after the leaves have fallen, and the second towards the end of winter in late August. As August is often a very wet month, care should be exercised in making the May spraying a very thorough one.

Where orange and lemon trees were not treated for Brown Rot last month, they should be sprayed during the early part of this month, using Bordeaux or Burgundy as advised in April notes. In tests made both by this Department and individual growers it has been shown that one spraying in April or early May is sometimes sufficient to control the disease for the remainder of the season, but should the season prove favourable for the fungus, the trees should receive a further spraying when signs of infection appear. Later sprayings have the effect of spotting the fruit, but it is better to remove spray spots from sound fruits at time of picking than to have the crop destroyed by disease.

In recommending spraying I am not overlooking the fact that there are some districts where the disease has not appeared, or at any rate, has not been noticeable, and in such places I would not suggest spraying merely as a preventive measure, but should it make its appearance spraying should be resorted to at once.

With the advent of wet weather baiting operations for Fruit Fly are largely ineffective, but trapping in orange and lemon groves should be continued throughout the winter months.

June.

Pruning of all deciduous trees should be pushed on with during this month.

Planting may be undertaken wherever the soil is not too wet and sticky.

Young plants, when received from the nursery, should be heeled in carefully so as to prevent the roots from drying out. To do this effectively the bundles of ten, in which the nurserymen usually tie up the trees, should be opened and each tree placed separately in the soil. If this is done as soon as the trees arrive, no harm will result if the planting has to be postponed for some weeks in the months of June or July.

The notes on planting for this month refer to deciduous trees only. Citrus trees give best results if planted at the latter end of August or early in September.

Any San José Scale infested orchards which have not received the first spraying mentioned in notes for May should be treated as early as possible this month.

Citrus growers should examine cracked oranges for signs of fruit fly, and destroy any found to be infested.

The orange export season commences this month, and this opportunity is taken again to stress the importance of handling the fruit most carefully when gathering, packing and loading. Bruised fruit and fruit with skin abrasions caused by finger nails will develop moulds and land in England in an unsaleable condition, a loss directly to the sender to the extent of the affected fruit, and indirectly and probably a much greater loss in bearing down the price of sound fruit offering on the same market.

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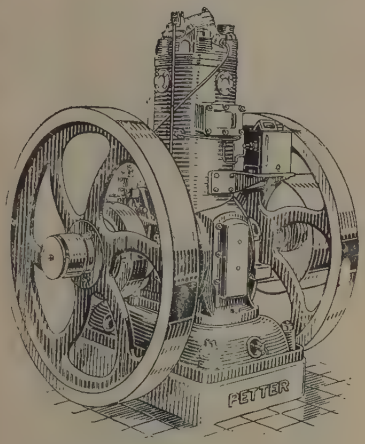

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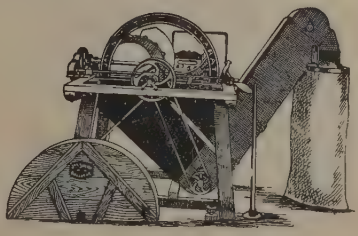


FLOWER, DAVIES, and JOHNSON

413-417 MURRAY STREET, PERTH.

1—4

SEASONABLE HINTS.

RED LEGGED EARTH MITE.

(*Penthaleus destructor.*)

L. J. NEWMAN, F.E.S.,
Entomologist.

This wide spread wet-season pest will be making its re-appearance following the first definite Autumn rains.

About the second week in May is the usual period for it to outbreak.

Should consistent early rains fall in April, and the weather not prove too hot, it will make its appearance.

Between November and May (Dry period) this destructive Acarid remains in a dormant egg stage. Upon the advent of dry condition in late Spring, the mite produces large numbers of these over-summering or resistant ova, which are dropped promiscuously about the surface of the ground. These eggs have the wonderful power to withstand the heat and desiccating winds of Summer.

Fig. 2. (Original.)
Adult female, dorsal view, magnified by 20.

Fig. 3. (Original.)
Adult female, ventral view, magnified by 20.

They are blown about the surface of the ground and collect under clods of earth, leaves, dry grass or other litter. Here they remain until the advent of the rains and the production of a suitable soil surface temperature. It is the appearance of this sudden plague or swarm of mites, which is so astonishing and puzzling to the farmer. It was only by a careful study of the life history of the mite that this phase of its life was discovered.

The question as to why this sudden swarm of the mite is answered by the fact of the presence of millions of the over-summering eggs.

From this point onwards, there is a succession of broods every 35 to 40 days, until the dry period against sets in. There are at least three generations during the wet season. The eggs during this period are deposited on the backs of the leaves of the host plants. Unfortunately there are many such plants, the mite being most cosmopolitan in its feeding tastes. As the late Spring weather comes on, with its warmth and dryness, we arrive again at the resting stage, and the trouble is over for the time being.

Fig. 4. (Original.)
Adult male, magnified by 20.

Fig. 5. (Original.)
Adult female, ventral view, showing eggs in body, magnified by 20.

The great damage done is to the young seedling plants. The advent of the mite synchronises with the germination of the seeds, both being dependent on the rain and humid warmth. This is unfortunate, as the seedling at this stage is very sensitive to any undue check inflicted upon it. The mites swarm all over the tender plants and suck out the juices, causing them to turn yellow and die.

By this serious invasion much of what would have been early Winter feed is destroyed. What plants do survive are held back in growth. Later, in the Spring, with the warming up of the soil the clovers, etc., will grow ahead of the mite and may eventually yield a fair crop.

The serious aspect of the trouble, however, is the loss of the early feed, when the lambing ewes and other animals are in most need of green nourishing food.

Subterranean Clover, one of our principal winter fodders, is most subject to attack. Burr Clover on the contrary is not so readily attacked, and in suitable localities might provide early feed until the Subterranean Clover got ahead of the mite.

In the effective control of this pest the main practical measure which I wish to emphasise, is the taking of prompt action upon its first appearance in the Autumn. Keep a sharp look-out and from the time the first mites are observed, allow a period of from 7 to 10 days to elapse before taking any action to destroy them.

This interval will permit of the hatching out of all the eggs. The land should then be well turned over by plough or other implement, thus burying and destroying the whole of the first brood.

The mite is very sensitive to being covered, as it is easily wounded, and has very poor powers of emergence even from under a thin layer of soil. If this work is done carefully and thoroughly and at the right time, a most successful blow will have been dealt the pest.

To delay action until another batch of eggs has been laid on foliage makes the control more costly and difficult. The same thing applies to the use of any insecticidal killing medium; if not used before the egg-laying stage is reached, much of the virtue of such treatment is lost.

The eggs of the mite are resistant to most insecticides and will produce a further crop of the pest. Further treatment, after the the first, should be made at intervals of 35 days.

It is obvious that the aim must be to destroy the mites before the egg-laying stage is reached. Many farmers fail to get good results because they neglect to make the attack at the opportune time.

Land kept under clean fallow is the greatest insurance against this and other insects. By keeping the land to be cropped the following Winter under fallow, there will be no plant growth for the mite, and consequently no eggs will be deposited thereon. The common Cape Weed (*Cryptostemma calendulaceum*) is a much favoured food plant. Not only does it provide food, but the broad leaves offer great shelter and make it difficult to reach the mite with an insecticide.

It is essential, therefore, to see that all grassy and weedy headlands and boundaries are kept well cleaned up, otherwise the pest will breed and multiply and migrate from such dirty areas to the crop. It is an all too common sight to see a well fallowed paddock surrounded by dirty weedy headlands and borders.

It will repay the farmer or gardener to make a complete and thorough job of it and do away with all such breeding grounds. Farm sanitation is also an essential to successful control.

In this short warning note, I have merely dealt with the necessity for being in readiness for prompt action on the appearance of the pest. For full details of the life history and methods of mixing and making of dusts, sprays, etc., apply to the Department of Agriculture for Leaflet No. 106.

LUCERNE FLEA (*Sminthuris viridis*).

This insect appears in our wetter heavy lands at the same time as the mite, and like it, carries over the dry summer months per medium of a resting egg stage. These eggs are deposited in the soil in cracks and crevices under clods of earth, etc. They hatch on the advent of Autumn rains.

The damage done is in the main similar to that caused by the mite. The young seedling and growing legumes are the favoured food, other crops being attacked to a lesser degree

The flea differs from the mite in its method of feeding in that it is provided with biting or chewing mouth parts.

When the foliage is seriously attacked, it is riddled with small irregular holes. In some instances only the veins remain, the plants are depleted of all green parts, and have the appearance of being bleached, when numerous cattle and sheep will refuse to feed on infested pastures. Cape and other succulent weeds are food plants and constitute shelter.

Lucerne Flea. *Smithuris viridis*, Bourlet). Greatly enlarged.

Being a powerful jumper, it can spread rapidly from an adjacent dirty area to a clean crop. The flea also floats on water and is frequently washed

down by running waters and may thus be carried a long distance from the original breeding ground. It is noted the pest follows water courses and the above appears to be one of the main reasons.

Preventative Measures.—First and foremost is clean weed-free fallow. Crops grown on such land will be free. All weeds such as Cape and other succulent growths must be got rid of around or adjacent to a crop, if it is desired to keep the crop free.

Treatment.—Prompt measures must be taken on the first appearance of the pest in Autumn. If action is delayed the flea will spread rapidly and very quickly get beyond control. When wide-spread over large areas, its general control is impossible. Trials have been made with various proprietary and home made preparations with varying results. Over limited areas and in gardens it may be successfully treated with any of the following mixtures:—

(1) Black Leaf 40 1 pint, Sunlight soap 4 lbs., water 80 gallons. Shred the soap and dissolve by boiling. Add to the Black Leaf 40 and water, mixing thoroughly. Apply cold with spray pump.

(2) Sunlight soap 8 ozs., turpentine 8 tablespoonsful, water 4 gallons. Dissolve soap; remove from fire and add turps, stirring well. Bring up to 4 gallons by the addition of hot water. Apply hot.

(3) Arsenate of lead 3 lbs., water 40 gallons. Spray over infested foliage. Note.—Being a poison all vegetables so treated within 3 weeks of cutting must be well washed before being consumed. Stock must not be pastured over any area so treated within a period of 3 weeks. If fodder is being cut, such as lucerne, it is advisable to spray after making the cut.

(4) Dusting powder as used against the mite is effective. 1 lb. of 15 per cent. carbolic powder mixed thoroughly with 3 lbs. of Thomas' phosphate or superphosphate. This is broadcasted by means of a super spreader or dust gun. If desired the manures may be substituted by any inert diluent such as lime or dust. Only mix sufficient for immediate use.

(5) Tarred screens drawn up and down an infested field will capture large numbers. The fleas hop into the screens and are there held captive by the tar and destroyed. In like manner shallow trays tarred may be successfully used.

MEADOW HAY.

(In Districts with from 20 to 30 inches Rainfall.)

G. K. Baron-Hay, B.Sc.(Agric.),
Assistant Superintendent of Dairying.

Since the general adoption by stockowners of the topdressing of pastures in the autumn with a phosphatic manure, and the popularity of Subterranean Clover as a means of supplying bulky spring feed, the possibilities of meadow hay is now being realised in districts having a rainfall of from 20 to 30 inches per annum.

Most farmers realise the high feeding value of well-made meadow hay, containing a mixture of grasses and clovers, as compared with oaten or wheaten hay. The cost of production is also in favour of meadow hay. At the Denmark Stud Farm and on other properties where permanent pasture is possible, the making of meadow hay has been carried out annually for some years. Farmers, however, in a district with an annual precipitation of from 20 to 30 inches have, until recently, been unable to consider the making of meadow hay as routine practice, owing to the difficulty of finding a pasture which may be depended upon to give sufficient growth for cutting.

The re-seeding characters of Subterranean Clover, which enables this crop to be looked upon as a perennial, its power of thriving under widely different climatic conditions and on varying soils, and its remarkable response to dressings of a phosphatic manure, have brought the making of meadow hay into the realm of profitable farming practice in these districts.

Suitable Pasture for Meadow Hay.

Owing to the dry summer experienced throughout almost the whole area under consideration, only annual grasses and clovers which produce liberal seed have been found useful as meadow hay crops. Among the grasses, the two most commonly found mixed with clovers are Silver Grass (*Festuca sp.*) and Soft Brome Grass (*Bromus mollis*), neither of which are good pasture plants.

Several clovers have been noticed by the writer growing on the Topdressing Demonstration Plots, which, if cut, would have yielded a good crop of meadow hay, *i.e.*, Cluster Clover (*T. glomeratum*) and Yellow Suckling Clover (*T. minus*) on the plots at Mr. W. O. Sewell's farm, Pingelly; Yellow Suckling Clover (*T. minus*) and Native Hop Clover (*T. procumbens*) on Mr. Parson's farm at Narrogin; Lotus major on the Experimental Plots at Young's Siding, and Subterranean Clover on quite a number of plots, notably on Mr. V. D. Pailthorpe's property at Kojonup.

Owing to the ease with which it may be grown and its large yield, undoubtedly Subterranean Clover offers the best prospects. Experience has shown that, as a general rule, it does not pay to cut a first year's crop of

this clover as meadow hay. It is preferable to allow the plant to seed liberally, grazing the dry clover as roughage during the late spring or summer, which will not harm the seeds.

Meadow hay crop on Mr. V. D. Pailthorpe's Farm, Kojonup—Subterranean Clover, Brown and Silver Grass.

When and How to Fertilise.

The experience of Mr. V. D. Pailthorpe, "Aberlechan," Kojonup, who cut 30 acres of meadow hay this season, will be valuable. Demonstrations conducted during the last four years in various districts throughout the State have proved that, for an early and prolific growth of Subterranean Clover, an application of a phosphatic manure, preferably superphosphate, is essential. Mr. Pailthorpe's practice, and one which is to be recommended, is to topdress with one cwt. of superphosphate per acre early in the autumn with or before the first rains, followed by a second top-dressing in spring.

Two pests which are apparently spreading through districts where clover crops are grown are the Lucerne Flea (*Sminthuris viridis*) and the "Red Spider" or Red Legged Velvet Earth Mite (*Penthaleus destructor*). Both these pests make their appearance soon after the first autumn rains have fallen, having been carried over the dry summer period in the egg stage. These eggs are present in myriads in a badly infested pasture, and the insects may make their appearance in plague form a few days after the first rains. *Judicious topdressing will assist in the control of these pests.* On areas known to be infested with either of these pests, topdressing should be delayed until the insects make their first appearance, which will be about a week after the first rains.

The fertiliser used should be superphosphate mixed with one-third its own weight of 15 per cent. carbolic powder. The carbolic powder should not be applied till the insects make their first appearance, as its efficacy is lost in a few days.

Provided this treatment is carried out not more than three weeks after the pests make their apearance, they will be killed before the egg-laying stage is reached.

The cost of the carbolic powder, where one cwt. of superphosphate per acre is applied, will be 10s. per acre, an expense well worth while, especially where the pest first appears in a small area, so as to prevent their spreading further. A full description of the Red Legged Velvet Earth Mite is given in the Department's Leaflet No. 106, which is a reprint from the "Journal of Agriculture," December, 1925.

An early application of superphosphate is always recommended, as the more vigorous the autumn growth, the better the chance of the plant surviving attacks from these pests, which generally disappear with the advent of dry weather conditions.

Autumn Grazing.

Stock may be grazed on the area intended for hay until well into the winter months, generally the end of July, but this will vary with the district and the season. Wherever stock are grazed on the area intended to be cut for hay, *a second dressing of superphosphate, one cwt. per acre, should be applied.* It has been noticed at the Denmark Stud Farm, and this year by Mr. Pailthorpe, that where this second topdressing is neglected the pasture does not make an even growth, due to the habit of stock keeping small patches of herbage well grazed while leaving other areas to grow and flourish. This uneven growth would, of course, detrimentally affect the yield of hay.

Crop in Illustration I. cut and ready for carting.—Yielded 2 tons per acre.

Time to Cut.

Good meadow hay should be fresh in appearance, have a pleasant aroma, and be soft in texture and be palatable. The percentage of leaf in comparison with stalks should be high, otherwise the digestibility will be lowered. These properties, known collectively as "quality," are to a great extent determined by the stage at which the crop is cut.

As a general rule, herbage intended for *meadow hay is cut too late rather than too early.*

When much grass is present among the clover, this should not be allowed to ripen seed, as the stems are then merely straw, the valuable nutrients having passed into the seed. These small seeds are not digested by stock, owing to the hard seed coat which they possess and to their small size.

The following results of an experiment conducted by Jordan, of the Pennsylvania Station, indicate the best time at which to cut Red Clover, and will be found to apply to most leguminous crops:—

YIELD AND NUTRIENTS IN AN ACRE OF RED CLOVER.

Stage when cut.	Hay per acre.	Ash.	Crude Protein.	Crude Fibre.	Carbo-hydrates.	Fat.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Full bloom ...	4,210	260	539	1,033	1,731	116
Some seed ripe ...	4,141	226	469	1,248	1,379	106
All seed ripe ...	3,915	208	421	1,260	1,378	94

This table shows that, when cut at full bloom, the clover crop yielded the largest amount of hay per acre, and also contained more ash, crude protein, carbo-hydrates, and fat.

Subterranean Clover, Rye Grass, and Cocksfoot—12 tons from 5 acres.
(W. R. Eckersley, Harvey.)

The fibre, or woody matter, which is the least valuable portion of the plant, was the only nutrient which increased by delaying cutting.

The loss of other nutrients after blooming is due chiefly to the withering and dropping of leaves, and is specially to be noted in leguminous crops where the fibre is less digestible than that of the grasses.

This table shows that "full bloom" is theoretically the best time to cut, but practical experience with Subterranean Clover shows that somewhat later is preferable or when the plant has sent down a good stand of young seed, but before the seed "burrs" have become ripened. This is because at any earlier date the plant is too sappy to be cured into good hay.

Where Subterranean Clover is concerned, it has been noticed that a few warm days cause the long leaf stems to wilt. This causes the leaves to lie down and make successful cutting impossible. This can be avoided by cutting at the time recommended above.

With Subterranean Clover, owing to its creeping habit, difficulty is sometimes experienced in cutting the crop with the ordinary mower. The runners hang on the outside point of the "cut," causing sidedraft and eventually clogging of the knives. This may be overcome by fixing a scythe blade, with cutting edge upwards, on the "pointer" which separates the crop. The runners passing along this blade are then cut.

Making the Hay.

The climate during the spring enables hay-making in the districts mentioned to be carried out with almost a certainty of success. For good hay the sooner the material can be brought to a fit condition for heaping into "cocks" the better.

It will be found that with an average crop, twelve hours' exposure to the sun in the swathe will be sufficient. This will prevent the finer portions and leaves from becoming dry and brittle. The crop may then be raked up into windrows and carted direct from the windrows.

Stock waste very little meadow hay, which need not be chaffed.

Raking the hay into heaps or "cocks" is not necessary unless carting cannot be carried out immediately, in which case it is advisable to prevent excessive drying with consequent loss of leaves in handling.

Yields of Meadow Hay.

It is not generally realised that quite as heavy yields of meadow hay may be expected as of cereal hay (oaten or wheaten). At the Denmark Stud Farm, yields of 1½ to 2 tons are not abnormal. Six experiments conducted on the Group Settlement areas this season averaged 1.96 tons of hay per acre.

Mr. V. D. Pailthorpe, Kojonup, whose crop is illustrated, cut 30 acres for a yield of 2 tons per acre; while an adjacent oat crop on similar ground, grown for hay, did not yield 1 ton per acre.

Moreover, Mr. Pailthorpe states that "the cattle prefer the meadow hay to the usual oaten chaff," and that "the sheep are already very keen on it, and waste very little" when fed as hay.

These results show that quite as heavy yields may be expected from meadow hay, with Subterranean Clover as a base, as from cereal crops.

LABIAL DERMATITIS OR "SORE MOUTH" OF SHEEP.

H. W. Bennetts, M.V.Sc.,
Veterinary Pathologist.

This disease manifests itself as a scabby condition affecting the skin around the lips, and sometimes also involves the skin of the face, particularly around the nostrils, eyes, and on the ears. It is non-contagious and is enzootic, showing no tendency to spread from the affected to other properties. Sheep only are affected and at any age, except as lambs sucking their mothers.

This condition has been noted from several districts, and is not uncommon in the State. Though not usually of very serious consequence, its appearance may cause considerable alarm to those not already familar with the disease.

Cause.—The effects produced are apparently due to wounds inflicted in the skin and musous membrane of the mouth from stubble, or more frequently from plants of a coarse prickly nature which are plentiful on many bush paddocks where sheep are depastured. The wounds become infected with germs from the soil, and the contamination results in inflammation, producing eventually the characteristic scabby condition.

Up to the present it has been impossible to implicate any particular organism, the infection being apparently a mixed one.

Symptoms.—Usually the first signs noted are the existence of scabs around the lips of some of the flock. A considerable proportion may be affected. I have not had the opportunity of seeing the earlier stages, but in some instances the condition has been described as commencing as a swelling of the face underneath and on each side of the jaw, the skin being dark in colour. Some sheep may die from inability to eat by reason of the swelling assuming considerable proportions.

In the later stages the only abnormality apparent is that the skin around the lips particularly is encrusted with thick dark or yellowish brown scabs. The affected parts are denuded of wool. The scabs crack and sometimes pus may exude, also bleeding is caused by friction of the irritated parts.

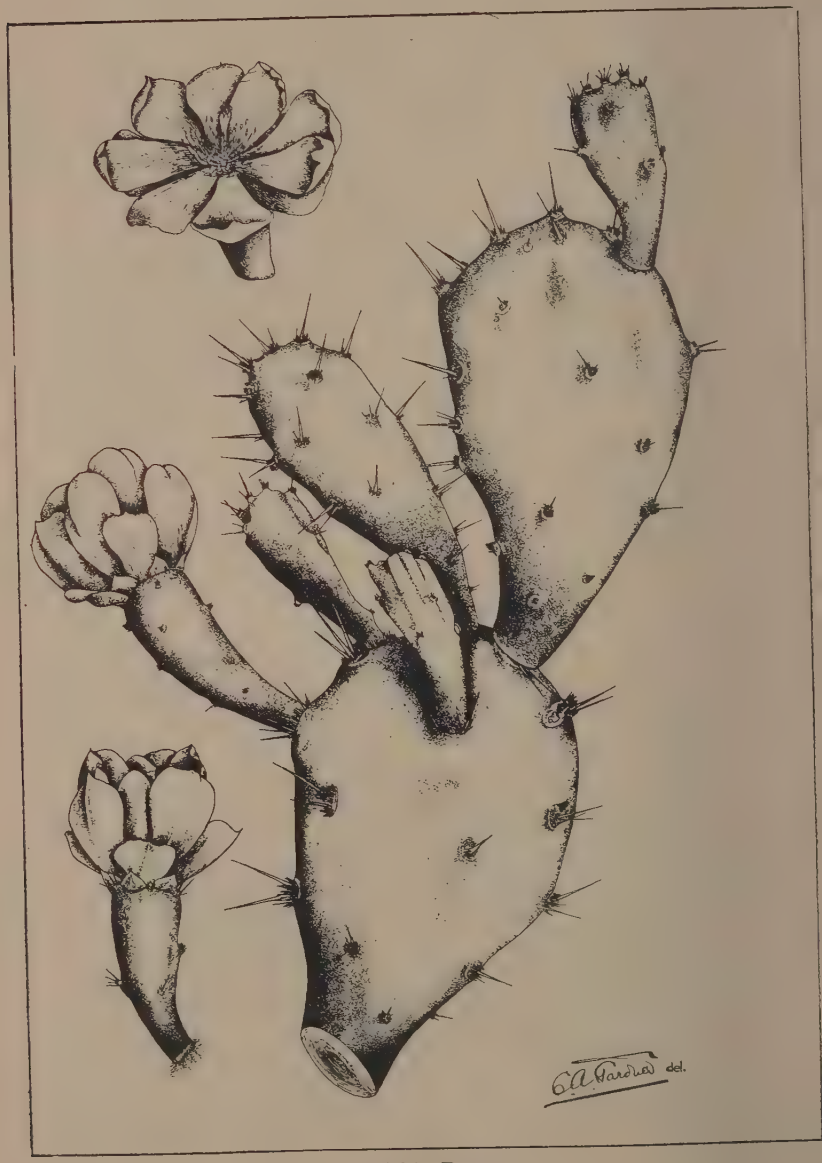
As mentioned above the scabby condition may affect larger areas of the skin of the face, particularly around the nostrils, eyes, and on the ears. Frequently the inside of the mouth itself is affected, in which case the breath has an objectionable odour. Branny deposits are visible on the palate, gums, and even on the upper surface of the tongue.

Recovery commences with the drying up of scabs followed by their falling off, leaving a clear pink woolless skin beneath. This soon returns to the normal condition, and no traces of the affection are left.

During the course of the disease no general disturbances are evident, except a falling off in condition, due to the irritation and the discomfort of feeding.

The death rate is very low, except among sheep which are affected with swelling of the face. (N.B. –This condition has no connection with "Bottle Jaw," or the swelling of the face with oedematous fluid, which affects rams only—"Big Head," and recovery rapidly follows the removal of the exciting cause, viz., the harsh vegetation.)

Treatment.—Scabs may be removed and the underlying parts washed with a disinfectant solution, such as two per cent. lysol, but the most important measure to be adopted is the moving of the affected sheep on to a softer non-irritant type of pasture, when recovery is usually spontaneous.



Prickly Pear.
(*Opuntia vulgaris*, Mill.)

PRICKLY PEAR.

(*Opuntia vulgaris*, Mill.)

W. M. Carne, F.L.S., and C. A. Gardner.

The name Prickly Pear is applied to species of Opuntia, of the Cactus Family, with flattened stem segments. The pest pears which are notorious in Queensland and New South Wales as constituting the most serious weed problem in Australia, are not known in South-Western Australia. One of the most serious, *O. Bentonii* (*O. inermis*), was found near Port Hedland in 1925. It is reassuring that Prof. Harvey Johnston, who has carefully studied the distribution of the pest pears, is satisfied that they will never become pests in the winter rainfall areas of Australia.

The common species in South-Western Australia is usually known as *Opuntia monacantha*, but *O. vulgaris* is the older and more correct name. This plant, originally a native of South America, has not spread in Western Australia. Planted by the early settlers as an ornamental plant in gardens, it has continued to thrive in many places which are now deserted, and is capable of withstanding very dry conditions. It may be seen, for instance, around the metropolitan district and the Vasse district, as well as in other old townsites, but makes little, if any, progress. Its exceedingly spiny nature makes it a most unapproachable plant; the large spines, and even the smallest bristles in which the plant abounds, stick into the flesh and, breaking, cause irritation.

Prickly Pear is a gazetted noxious weed for the whole State, under the names of *Opuntia monocantha* and *O. inermis*. It is never likely to prove serious in the temperate parts of the State. Wherever it is seen it should be destroyed, for once it becomes established it is exceedingly difficult to eradicate, since the fleshy articles left on the soil will root again.

Several methods have been tried in eradicating Prickly Pear:—Cutting down and burning, poisoning with arsenical solutions, or treatment with arsenious chloride gas; destruction by introduced parasites, *e.g.*, insect and fungus parasites; and lastly the utilisation of the plant as a stock food when the spines have been removed. The plant is not sufficiently common in Western Australia to warrant any such measures beyond the mechanical method of grubbing, and this should be done wherever the plant is found, especially if there should be noticed any tendency on its part to spread.

Description of Plant.—An erect leafless plant of two to several feet in height with stout woody stems when old, but mostly consisting of obovate fleshy jointed articles, which may bear flowers, or other joints, or both. These joints are flat with rounded edges, and bear numerous slender pungent spines from ¾in. to 2in. long either singly, or two together, and surrounded by a short small cushion of slender bristles which are more irritating than the spines themselves.

Flowers yellow, rather large, with sepals and petals in several rows, the calyx-tube resembling one of the smaller articles of the plant, but more pear-shaped. Fruit pear-shaped with cluster of small tufts of bristles, but no long spines, pulpy inside with few seeds. For further particulars, see plate.

COPPER POWDERS FOR THE PREVENTION OF BUNT IN WHEAT.

RESULTS OF 1926 FUNGICIDE EXPERIMENTS.

E. J. LIMBOURN, Merredin Experiment Farm.
G. L. THROSSELL, Dipl. Agric., Agricultural Adviser.

In the *Journal of Agriculture* for June, 1926, Vol. III., No. 2, the results were published of the Fungicide Experiments conducted at the Chapman and Merredin Experiment Farms up to the end of 1925.

In the 1925 experiments the fungicidal properties of six brands of commercial Copper Carbonate, "Smutol" (copper oxychloride) and Copper Acetate were tested. The very bunt susceptible variety, "Booran," was used, being artificially infected with bunt spores (*Tilletia levis*) at the rate of one part of spores to 750 parts of wheat (by weight). Wheat so infected is known as "smut tipped," and approximates a smutty sample of farmers' seed. That the spore "dosage" of 1 to 750 was not severe enough was indicated by the average percentage infection of the control rows (infected and untreated), viz., 22 per cent. at Merredin and 13 per cent. at Chapman. In the 1924 experiment the average percentage infection was 74 per cent. at Merredin and 30 per cent. at Chapman.

While all the treatments (with the exception of Copper Acetate at the rate of 1 oz. per bushel) were successful in controlling the disease, it was decided, in view of the low average percentage infection, that the test had not been severe enough to bring out the relative fungicidal properties of the different powders tried. In 1926, therefore, the experiments were continued on the same lines as in the previous experiment with the exception that the rate of artificial bunt infection was considerably increased. In 1925 the rate was 1 to 750, but in 1926 it was increased to 20 to 750. This rate was arrived at by experiment, and was found to be the "saturation point," *i.e.*, the maximum dosage of spores which would adhere to the seed coat of the wheat grains, which appear quite black when treated at this rate. It will be seen, therefore, that this test was a very severe one. Exactly the same fungicides were used in this experiment as in 1925, as well as a new one "Vitrioline."

The results of the analysis of these powders made by the Government Mineralogist and Analyst (Dr. E. S. Simpson) in 1925 are again produced hereunder:—

TABLE 1

ANALYSIS OF FUNGICIDES FOR TESTS, 1925 AND 1926.

Fungicide.	Copper.	Retained by 200 mesh sieve.	Density. lbs. per cubic foot.
	per cent.	per cent.	
Copper Carbonate "A"	46·48	43·6	63·2
" " "B"	50·04	0·6	58·5
" " "C"	51·08	17·5	61·0
" " "D"	49·88	5·15	76·9
" " "E"	49·76	7·2	68·1
" " "F"	53·48	8·3	72·2
Average of 6 W.A. samples	50·12	12·07	66·7
Best Californian Copper Carbonate ...	50·36	6·20	62·5
Smutol	54·36	12·2	40·2
Copper Acetate	29·96	...	...

Dr. Simpson supplied the following report on the analysis of "Vitrioline":—

"Insoluble in water—28.84 per cent.

Total acid soluble copper—16.63 per cent.

The insoluble in water consisted mostly of calcium phosphate with a little silica, whilst the soluble portion was copper sulphate with a small quantity of copper acetate."

The variety used was a machine-threshed sample of "Booran," a variety which has been used for several years on account of its high bunt susceptibility.

The work of infecting the seed with bunt spores (*Tilletia levis*) at the rate of 20 to 750, and subsequent treatment with the various fungicides, was carried out in the laboratory of the Department of Agriculture in a similar manner to that previously described.

THE MERREDIN EXPERIMENT.

The seed was received for planting on 26th May, but as there was insufficient moisture in the soil to ensure a ready germination, planting was delayed until 8th June, when the whole of the experiment was planted on that day. Each treatment was planted in chain rows, 2¼ links apart, 100 seeds to each row, with a control (infected—untreated) row every fourth row.

The whole experiment was repeated five times and was planted on the "check-board" system, *i.e.*, the various treatments being scattered systematically in an endeavour to overcome experimental error due to any variation in soil conditions. The following diagram of a section of the experiment will help to illustrate this:—

Control.	Control	Control	Control	Control
Treatment No. 9	Treatment No. 11	Treatment No. 14	Treatment No. 10	Treatment No. 2
„ No. 8	„ No. 9	„ No. 11	„ No. 14	„ No. 10
„ No 7	„ No. 8	„ No 9	„ No. 11	„ No. 14
Control	Control	Control	Control	Control

In order to test whether the fungicides have an injurious effect on the germination and early development of the plants, a count of the plants above ground was to have been made on the 10th, 20th, and 30th days after planting. Owing, however, to adverse weather conditions it was not possible to make counts at these periods, these being made on the 13th, 20th, and 35th days.

Variations in the count of several of the control rows—the final count being less than the earlier count—led to the finding of seedlings affected with a foot-rot disease, which was identified by the Botanist and Plant Pathologist (Mr. W. M. Carne) as *Pleosphaeria semeniperda*, this being the first record of the disease in this State. The most noticeable symptom of the disease in the seedling stage was the browning of the young leaves, usually at the two-leaf stage, affected plants rarely getting past this stage. During the season stunted plants were also found showing evidence of the disease.

No signs, however, could be found in any rows planted with Copper Carbonate treated seed, pointing to the probability that this fungicide has a controlling effect on the disease. The data obtained is shown in the table below.

The rows were cultivated to keep down the weeds and break up the soil, which had become consolidated through walking between the rows to count the plants.

During growth it was very noticeable that the control rows were all somewhat backward, and appeared to be stunted compared with the treated rows, while no difference could be noticed in the plants under the various treatments. At harvest time the plants were carefully examined, all bunted plants being removed, and the percentage calculated Plants were found for the first time with both Bunt (*Tilletia levis*) and Flag Smut (*Urocystis tritici*). Previously plants found with Flag Smut were free from Bunt.

The following table shows the results of the experiment at Merredin:—

TABLE 2.—MERREDIN EXPERIMENTAL FARM.

FUNGICIDE EXPERIMENT, 1926.

Infection 20–750—Variety "Booran"—Planted June 8th, 1926.

Treatment. Fungicide.	Rate per bushel	Total number of seeds planted.	Average Results of Five Sections. Details of Growths. Per cent. Germination at 13 days.	Per cent. Germination at 20 days.	Per cent. Germination at 35 days.	No. of plants died during growth.	No. of plants matured.	Details of Matured Plants. No. of clean plants.	No. of bunted plants.	Per cent. bunted plants.
Infected—Untreated (Control)	ozs. ...	500	25	79	83	5	77	17	60	78
Copper Carbonate A ...	2	500	18	75	91	2	89	59	30	34
Do. B ...	2	550	12	73	89	3	86	48	38	44
Do. C ...	2	500	20	80	89	0	89	46	43	48
Do. D ...	2	500	14	85	94	1	93	71	22	24
Do. E ...	2	500	14	85	92	1	91	46	45	49
Do. F ...	2	500	10	81	91	0	91	63	28	31
Vitrioline	2	500	12	69	85	0	89	47	42	47
Smutol	2	500	10	77	89	1	88	53	35	40
Copper Acetate	2	500	9	79	89	0	89	52	37	42
Copper Carbonate B ...	1½	500	14	77	87	0	89	46	43	48
Smutol	1½	500	9	72	87	0	87	57	30	34
Copper Acetate	1½	500	9	78	86	0	86	50	36	42
Copper Carbonate B ...	1	500	12	74	88	0	90	42	48	53
Smutol	1	500	12	78	88	0	90	54	36	40
Copper Acetate	1	500	8	73	87	0	87	38	49	56
Infected—Untreated (Control) ...		500	9	63	77	0	78	20	58	74
Infected—Untreated—Average of 30 plots ...	...	...	13	67	74	3	71	17	54	76

THE CHAPMAN EXPERIMENT.

This experiment was planted on the 26th May, the ground being in a very good condition for planting. The whole experiment was repeated six times here on account of convenience of layout, but the rows were not planted on the "check-board" system as at Merredin.

Germination counts were made on the 10th, 20th, and 30th days after planting. The results were calculated in a similar manner to Merredin.

The whole of the field work at Chapman was carried out in a thorough and painstaking manner by Mr. D. R. Bateman, whose work we desire to acknowledge.

The following table shows the results for Chapman for 1926:—

TABLE 3.—CHAPMAN EXPERIMENT FARM.

FUNGICIDE EXPERIMENT, 1926.

Infection 20-750—Variety "Booran."—Planted 26th May, 1926.

Treatment.		Total number of seeds planted.	Average Results of Six Sections.							
			Details of Growth.					Details of Matured Plants.		
Fungicide.	Rate per bushel		Per cent. Germination at 10 days.	Per cent. Germination at 20 days.	Per cent. Germination at 30 days.	No. of plants died during growth.	No. of plants matured.	No. of clean plants.	No. of bunted plants.	Per cent. bunted plants.
	ozs.									
Infected—Untreated (Control)	...	600	71	89	89	3	86	16	70	81
Copper Carbonate—A.	2	600	70	88	89	2	87	83	4	5
Do. B.	2	600	79	91	92	0	92	87	5	5
Do. C.	2	600	78	91	92	1	91	85	6	6
Infected—Untreated (Control)	...	600	71	87	89	1	88	13	75	85
Copper Carbonate—D.	2	600	77	92	93	1	92	89	3	3
Do. E.	2	600	81	92	94	1	93	82	11	15
Do. F.	2	600	68	84	88	1	87	83	4	5
Infected—Untreated (Control)	...	600	75	90	91	1	90	20	70	78
Smutol	2	600	76	92	93	1	92	80	12	13
Copper Acetate	2	600	71	89	89	1	88	79	9	10
Vitrioline	2	600	82	91	92	1	91	75	16	18
Infected—Untreated (Control)	...	600	75	86	87	2	85	15	70	82
Average—all Controls	...	4,800	74	87	88	2	86	15	71	83

The results this season confirm those of the previous years, both in this and other States in regard to the effect which the two dry-powder copper fungicides (in the form of the carbonate and oxychloride) on the early development and subsequent growth of the plants. In fact, it has been especially noted at Merredin that the growth of the infected and treated plants is very much better than in the controls (infected and untreated). Copper Acetate, on the other hand, appears to have a slight retarding effect on the germination during the first two weeks after germination, though having no serious effect on the total germination and ultimate vigour of the plants.

This is the first time that the average percentage infection of the controls at the Chapman Experiment Farm has exceeded that at Merredin, as the following table will show—

TABLE 4.

Year.	Average per cent. bunt infection of controls.	
	Merredin.	Chapman.
	per cent.	per cent.
1922	77	37
1923	53	49
1924	74	30
1925	22	13
1926	76	83

Previously it has always been found that the climatic and soil conditions have been more favourable for the development of the fungus at Merredin than at Chapman. The soil and climatic conditions at Merredin at the time of planting (June 8th) were unfavourable for the growth of the plants; heavy rains, before and after sowing, together with cold weather, made the seed bed very cold and wet, retarding the growth of the plants, and apparently lowering their resistance to the disease. The conditions at Chapman, however, where the experiment was sown two weeks earlier, were more favourable, and while the percentage infection of the controls was high, the control of the disease in the treated rows was fairly good.

That seasonal and soil conditions have been responsible for such a high percentage of bunted plants this year in the Merredin Experiment is borne out by the fact that, in an experiment conducted in 1922, when the seed was "saturated" with bunt spores, no bunted plants appeared in the Copper Carbonate-treated rows.

The best result at both farms was obtained with Copper Carbonate "D" with 3 per cent. bunted plants at Chapman, and 24 per cent. at Merredin. There was quite a considerable variation in the percentage of bunted plants in the rows treated with the various brands of Copper Carbonate. No correlation, however, could be noted between the fungicidal properties on the one hand and the chemical and physical analyses on the other. This confirms previous experiments, which show that there is a considerable variation in the fungicidal properties of the dusts available for commercial use. Various standards, to which these dusts should comply, have been suggested, and among these is the Californian one suggested by *Mackie and Briggs.

In order to obtain information relative to a standard suitable for W.A., the various commercial samples of Copper Carbonate for sale in this State were analysed (Table 1), as well as one received from California, which complied with the *Californian* standard. With this information available it was decided, on the advice of the Government Mineralogist and Analyst (Dr.

* Mackie & Briggs Calif. Univ. Bull. No. 364, 1923.

Simpson), to suggest the following tentative standard for commercial copper carbonate for W.A.—

(1) It shall contain not less than 50 per cent. Copper, present in the form of green basic Carbonate of Copper. Copper in the form of uncombined oxide, or of sulphate or other water soluble compound to be considered of no value.

(2) Not more than 6 per cent. of the whole shall remain on a 200-mesh sieve when shaken with abundant water poured through the screen, and subsequently washed thoroughly on the screen with a flowing stream of water.

(3) The bulk density shall not exceed 65 lbs. per cubic foot, as determined by tapping down by hand 30 grammes of powder in a 50 c.c. graduated cylinder.

(4) The colour shall be light green.

Copper Carbonate "D" with a density of 76.9 lbs. per cubic foot, has the highest density of those tried, and exceeds the suggested standard by 11.9 lbs. It has given the best results at both farms this season, and thus indicates that the standard in this connection may need to be revised, and that there may be other factors beside the percentage of copper, fineness and density, which influence the fungicidal properties of the powder. Dr. Simpson suggests that the copper hydroxide portion of the powder may be a better fungicide than the basic carbonate.

Thus the question of the standard of copper carbonate has not yet reached finality. In the meantime those who will be purchasing this commodity locally are advised to obtain samples which approach the tentative standard suggested for this State.

Copper acetate is not as satisfactory as copper carbonate on account of the retarding effect on germination. "Smutol" has done equally as well as copper carbonate during both seasons. "Vitrioline" has only been tested for one season, and will be given a further trial.

SUMMARY.

1. Copper Carbonate, Copper Oxychloride ("Smutol") and "Vitrioline" have no injurious effect on germination and young growth; in fact, considerable improvement was noticed over the untreated rows. Copper Acetate has a slight retarding action on germination.

2. Copper Carbonate and "Smutol," at the rate of 1 to 1½ozs. to the bushel, are capable of controlling wheat when slightly bunt-infected. Two ounces per bushel should be used when the wheat is "smut-tipped." These copper powders are not recommended when the seed is blackened with spores, for as shown by these experiments, when soil and seasonal conditions have been favourable to bunt, these powders have proved unsatisfactory. For heavily bunted seed it is more satisfactory to use the bluestone or formalin solutions, or *better still, reject the seed.*

It is also known that the seed can be treated at any time before seeding and stored without any injurious effect on the vitality of the seed.

The following tentative standard has been suggested for Copper Carbonate—

Copper content not less than 50 per cent.

Fineness—94 per cent. to pass a 200-mesh sieve in aqueous suspension.

FIELD EXPERIMENTS AT THE AVONDALE STATE FARM.

F. L. SHIER, B.Sc.Agric., and
H. J. BAILEY, Farm Manager.

RATE OF SEEDING EXPERIMENT.

The object of this experiment is to determine the most economical rate of seeding per acre. This is the first season that experiments have been conducted on this farm.

The soil on which they were planted was typical Jam and York Gum country, which had been fallowed 4 to 5 inches deep with a mouldboard plough in July, 1925. Sheep were pastured on the fallow, which was cultivated with a "springtyne" cultivator during the third week in March, the fourth week in April, and again on the 1st June. Heavy rain fell on the 2nd June, making it necessary to harrow before drilling.

Owing to unfavourable weather conditions during the latter part of May the planting was delayed until the 4th June. The variety "Nabawa" was planted at the following rates, viz., 45lbs. (control), 60lbs., and 90lbs. per acre, each plot being one-eighth of an acre, repeated five times. Superphosphate (22 per cent.) was applied at the rate of 150lbs. per acre.

At the time of planting (4th June) the ground was in a very moist condition, and it was found necessary to harrow the plots after seeding to ensure the seed being properly covered.

The monthly rainfall, as officially recorded at Beverley, together with the average for the past 41 years, is shown hereunder:—

Year.	Jan.	Feb.	Mar.	April.	Growing Period.							Nov.	Dec.	Total.
					May.	June.	July.	Aug.	Sept.	Oct.	Total growing period.			
1926 ...	11	68	166	185	213	300	651	193	195	162	1,714	90	6	2,240
Average 41 years	30	43	58	89	222	322	324	248	169	100	1,385	47	41	1,693

As will be seen, the rainfall during the growing period (May-October) was 329 points above the average. This was accounted for during the month of July, when the rains were almost continuous, resulting in the land becoming water-logged, and remaining in this condition almost until September. During this period the crop made very slow growth, but with the return of normal conditions in September it made a rapid recovery.

The results obtained are set out in the table hereunder:—

AVONDALE STATE FARM—RATE OF SEEDING EXPERIMENT.

GRAIN YIELD.

Variety "Nabawa"—Rate of Super. 150lbs. per acre—Planted 4th June, 1926.

Rate of Seed per acre	Computed Yield per acre.										Average Yield per acre.		Percentage.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
90lbs	16	24	20	48	23	4	23	20	21	20	20	59	107
45lbs. (Control) ...	17	36	18	0	22	40	20	24	19	44	19	41	100
60lbs.	19	20	20	0	22	32	21	28	19	28	20	34	105

These results indicate that a slight advantage can be expected when 60lbs. of seed are sown, but this being the first year the trials have been conducted at this farm, no definite conclusion can be drawn.

RATE OF SUPERPHOSPHATE EXPERIMENT.

This experiment was designed to ascertain the most profitable rate of superphosphate to apply per acre.

The land on which the experiment was sown, was fallowed and cultivated at the same time, and in the same manner as described above, and was planted on 4th June.

Three rates of superphosphate were decided upon for the carrying out of the experiment, viz., 75lbs. (control). 150lbs., and 225lbs. The plots were each one-eighth of an acre, and were repeated five times.

Owing to an accident while harvesting Section 5, a portion of the grain was lost, so the results of this section have not been included.

The results obtained are shown in the table hereunder:—

AVONDALE STATE FARM—RATE OF SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELD.

Variety "Nabawa"—Seed 50lbs. per acre.—Planted 4th June, 1926.

Rate of super. per acre.	Computed Yield per acre.				Average yield per acre.	Percentage.
	Section 1.	Section 2.	Section 3.	Section 4.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%
225lbs.	21 28	22 56	23 12	21 52	22 22	104
75lbs. (Control) ...	20 40	21 12	22 24	21 44	21 30	100
150lbs.	22 32	21 4	22 40	20 32	21 42	101

From the results it would appear that the increased rate of application of superphosphate is not profitable, but as the results are for one year only it would not be wise to draw any definite conclusions.

BASIC SLAG EXPERIMENT.

At the beginning of last season it was reported that large quantities of basic slag were being used in the Beverley district in preference to superphosphate. An experiment was, therefore, prepared to demonstrate the relative value of superphosphate (22 per cent.) and basic slag (17 per cent.). Two comparisons were to be made:—

(a) Using equal weights of basic slag and superphosphate (75lbs. each).

(b) Using equivalent quantities of phosphoric acid, *i.e.*, 97lbs. of basic slag supply the same quantity of phosphoric acid as 75lbs. of superphosphate.

Thus there were three plots:—

(1) 97lbs. basic slag (17 per cent.).

(2) 75lbs. superphosphate (22 per cent.)—control.

(3) 75lbs. basic slag (17 per cent.).

These plots were repeated five times, all of which were harvested for grain. The yields obtained are shown hereunder:—

AVONDALE STATE FARM—BASIC SLAG EXPERIMENT.

GRAIN YIELD.

Variety "Nabawa"—Rate of seed 50lbs.—Planted 3rd June, 1926.

Rate of Fertiliser per acre.	Computed Yields per acre.										Average Yield per acre, 1926.		Percentage 1926.
	Section 1.		Section 2.		Setcion 3.		Section 4.		Section 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	
97lbs. basic slag ...	15	52	15	28	16	0	15	20	14	24	15	25*	92
75lbs. super. (Control)	17	20	17	4	17	28	16	40	15	44	16	51	100
75lbs. basic slag	14	24	15	44	16	24	14	40	*12	40	15	18	91

* A small patch down—unable to strip. Plot excluded from average.

The results of only one year's trial are decidedly in favour of the superphosphate. When the same quantity of phosphoric acid is used, the water soluble phosphoric acid, as supplied by the 22 per cent. superphosphate, gave an increased yield of 1 bushel 26lbs. per acre over the citrate soluble phosphoric acid, as supplied by the 17 per cent. basic slag. When equal rates of fertiliser are sown, the superphosphate has the advantage by 1 bushel 33 lbs. Thus, so far, basic slag has not demonstrated its superiority over superphosphate, but no definite conclusions can be arrived at on the basis of one year's experiment.

When you do anything from a clear judgment that it ought to be done, never shun the being seen to do it, even though the world should misconstrue it. For if you do not act right, shun the action itself; if you do, why are you afraid of those who censure you wrongly.—*Epictetus.*

If you have assumed any character above your strength, you have both made an ill figure in that, and quitted one which you might have supported. —*Epictetus.*

POISON DUSTING FOR LOCUSTS.

L. J. Newman, F.E.S.,
Entomologist.

During the past locust period—August to October—the common plague species, *chortoicetes terminifera*, was much less in evidence than for the four preceding years.

There were one or two outbreaks of a serious nature in isolated areas. These pleasing and profitable results have been brought about, in the main, by the combined efforts of the Department and the farmers concerned.

As advised by this office large portions of ring-barked country, known to be the breeding grounds of the locust, were cleared and brought under the plough, thus preventing egg-laying in such areas, or if eggs had already been deposited in the soil, exposing same to the destroying elements of weather, and also insect and bird enemies.

Large areas were successfully treated with poison baits or sprays. Now that the pest has been reduced and brought low, it behoves all farmers to resist the natural tendency to ease off and become lulled into a false feeling of security. Unfortunately, many farmers do not seem to realise the danger that lurks in the few locusts here and there.

These should be destroyed, as they are the forerunners of the plague swarm. Whilst in reduced numbers they are easier and cheaper to deal with. It is manifestly impossible to deal with single locusts, or even with very small scattered lots, in the thinly populated areas of the country, where these habitually occur.

For this reason the locust will probably never be exterminated. At the same time, a full appreciation of the importance of dealing with the pest when at its minimum will help to keep the insect under better control than if allowed to reappear in plague form before further action is taken.

The bait and spray used so effectively were the following:—

Poison Bait.—Bran 30lbs., molasses 4lbs., Paris green or arsenite of soda 1lb. These ingredients are mixed thoroughly together with sufficient water to make into a crumbling mash.

The bait is broadcasted amongst the hoppers before 10 a.m. The locust fasts all night and begins feeding as soon as the temperature becomes warm enough to excite movement. Naturally after this period of fasting they are hungry, and will readily partake of the bait, which is scattered amongst them, and are thereby poisoned.

Poison Spray.—This is composed of 1lb. of arsenite of soda dissolved in half gallon of water (hot for preference). Likewise dissolve 4lbs. of molasses, and allow both to cool before mixing; when cool mix the two together and make up to 16 gallons, with water. This is sprayed over the hoppers and the foliage upon which they are feeding, killing them by contact and internal poisoning.

It is, however, with the poison dusting method that I wish now to deal.

In the years 1922 and 1923 it was found by Malley, Entomologist, of South Africa, that arsenite of soda, in powdered or dust form, applied as a dry contact insecticide against locusts, gave excellent results. He was able to prove by experiments that locusts so treated died in from four to five hours. E. E. Sordarg, a Russian entomologist, made a series of like experiments, with equally good results. It had also been proved by experiment that when the poison dust is applied to the body of the insect only (the legs and antennae being kept free) death quickly follows.

This establishes the fact that the poison is absorbed through the skin. Had the antennae and legs been dusted, it would be possible that death was caused by internal poisoning, owing to the habit of insects of cleaning their antennae or other appendages with their mouth.

It has thus been proved that the poison dust kills both by direct absorption of the poison through the skin and also by the taking of it through the mouth.

To test this method on our local plague locust, *Chortoicetes terminifera*, a cage experiment was made.

Original.

Adult or full-grown Locust.

Chortoicetes terminifera.

A number of locusts were captured and placed in same. These were then dusted with a finely prepared arsenite of soda powder mixed with an inert diluent, at the rate of 1 part to 16 parts.

The result of the test was most encouraging, all the treated locusts dying within 24 hours.

In the untreated control cage no locusts died during the same period.

From these experiments it was demonstrated that our plague locusts as readily succumbed to arsenite or soda dust as those species found in other parts of the world.

Having proved by cage experiments that the local locust could be readily destroyed by the application of poison dust to its body, it was decided to make a field test. Unfortunately, from the experimental point of view, we were unable to locate any great army of hoppers, due to the successful operations of the previous year and somewhat adverse climatic conditions.

The farm owned by Mr. Alfred Purdy, of Kununoppin, was the scene of the trial. Mr. Purdy has assisted greatly all through the various baiting and spraying experiments, and in like manner has helped in this test.

It was during the previous baiting and spraying tests that the water difficulty was brought home to us. The locusts would often be found miles from a dam, thus necessitating much cartage. It was thought, therefore, that if at all practical, dusting would supersede the other methods, for the reason that it would prove more economical in every way.

The test was made on 14th September, using the same powder as in the cage trials. The day was bright and warm, with a light East wind blowing. For the application of the dust a small dust gun known as the "Niagara" was used. This is strapped to the body, and is fitted with a flexible metal nozzle. The machine holds about 6 to 8 lbs. of the dusting powder and is very easily worked.

Illustration depicting the application of Poison Dust to Locusts. *Original.*

The dust on a still day would only travel as far as the power of the machine drives it; it is therefore of advantage to have a light steady wind blowing when applying. The precaution was taken of covering the mouth and nose with a handkerchief, to prevent the dust from being inhaled or swallowed. With ordinary care and working, so that the dust drifts away, there is little danger. It was found necessary to use about 5lbs. of dust

to the acre. The results of the tests were must encouraging. The locusts were observed to be dying within two hours of treatment, and two days later large numbers of dead locusts were found on the experimental area.

As before stated, we were not able at the time to locate a large swarm of hoppers, and hence the experiments were somewhat limited. It is intended, when opportunity next presents itself, to continue the work with the view of determining the cost and effectiveness of this method as compared with the previously used baits and sprays.

If it should prove cheaper and as effective, there are several good reasons why this method should be adopted.

The advantages are the following:—

(1) Water is not necessary, which saves much cartage, time, and labour.

(2) The powder, if kept dry, does not have any chemical complications.

(3) The dry powder is comparatively light to transport.

(4) It is more easily and quickly applied.

(5) It requires no mixing or heating.

(6) It can be conveyed into locust areas where no vehicle could penetrate.

(7) It is always ready to use.

The powder must be kept perfectly dry, otherwise it will not readily pass through the dust gun. The dust must also be in the finest form possible, so that it will spread well when distributed.

Being poisonous, it must not be inhaled.

In some parts of the world the application of arsenical dusts for the destruction of locusts is being successfully carried out by means of airplane dusting. Should the pest be permitted to get a hold on our country, it would probably be necessary to resort to similar methods here. Fortunately, the locust scourge has never assumed such serious proportions with us, but nevertheless it is incumbent on all growers concerned to use the known proved measures for their control, and by so doing save the State from great loss and expense.

FARMERS' FIELD TRIALS.

H. Rudall,
Field Officer.

The Farmers' Field Trials carried out during the 1926 season were rates of seeding and rate of super with wheat, and variety tests with wheat.

The wheat variety trials were conducted at Bencubbin, Southern Cross, East Goomarin, and Welbungin.

The rate of seeding trials with Merredin variety were at Bencubbin, Southern Cross, Welbungin and Mukinbudin.

The rate of super trials were at Southern Cross, East Goomarin, and Mukinbudin.

Except in the trials at Mukinbudin where the area of each plot was 0.4 acres, the average of the plots was half an acre. At all centres each trial was platnted in duplicate. In the wheat variety trials, comparisons were made with S.H.J. and M15 (now named "Noongaar"), and the recognised drought-resister "Gluyas Early."

All the plots were sown on well worked fallow and the bounteous rains that fell in the Eastern Districts during the latter part of the fallowed period, provided a good reserve of moisture in the soil, enabling the plants to withstand better the severe variable climatic conditions which prevailed during the early part of September, when the early varieties were issuing from the flag and approaching the flowering stage.

The details of the cultivation of the plots at the different centres are:—

CULTURAL NOTES.

East Goomarin (E. Randolph) Variety Trial and Rate of Superphosphate Trial.—The land was ploughed in July, 1925; cultivated with springtyne September, October, and twice in December, 1925; again in April and May, 1926; skim-ploughed prior to seeding; sown 20th May. Variety trial 45lbs. seed and 75 lbs. super; rate of super trial 45lbs. seed per acre.

Bencubbin (B. W. G. Hopwood) Variety Trial and Rate of Seeding Trial.—The land was ploughed in July, 1925; cultivated with springtyne in September; tandem-disc harrowed in November, 1925; again with springtyne in January; tandem-disc harrowed in February; harrowed in March; cultivated with springtyne in April, 1926; sown 12th-13th May. Variety trial 45lbs. seed and 85lbs. super; rate of seeding trial 85lbs. super per acre.

Mukinbudin (A. G. Reynolds) Rate of Seeding and Rate of Superphosphate Trials.—The land was ploughed in June, 1925; cultivated with springtyne with light harrows behind in July, with springtyne in October, 1925; harrowed in March; cultivated with springtyne in April; harrowed after light rains in May, 1926; sown 18th May. Rate of seeding trial 75lbs. super; rate of super trial 45lbs. seed per acre.

Southern Cross (E. H. Richards) Variety Trial, Rate of Seeding, and Rate of Superphosphate Trials.—The land was ploughed in June, 1925; cultivated with springtyne in October, 1925; harrowed in January; cultivated with springtyne twice in March; harrowed in May, 1926; sown 14th May; variety trial 45lbs. seed and 75lbs. super. Rate of seeding trial 75lbs. super; rate of super trial 45lbs. seed per acre.

Welbungin (W. Bagshaw) Variety Trial and Rate of Seeding Trial.—The land was ploughed in June, 1925; cultivated with a sundercut in August; cultivated with springtyne in October and December, 1925; harrowed in February; cultivated with springtyne twice in April, 1926; sown 13th-14th May. Variety trial 45lbs. seed and 85lbs. super; rate of seeding trial 85lbs. super per acre.

The rainfall recorded at the different localities is shown in the table below:—

RAINFALL AT VARIOUS CENTRES, 1926.

Centre.	Jan.	Feb.	Mar.	April.	Growing Period.						Total, May-Oct.
					May.	June.	July.	Aug.	Sept.	Oct.	
Bencubbin ...	41	70	296	84	86	208	265	116	89	85	849
Welbungin ...	11	121	205	95	60	208	250	141	125	55	812
Mukinbudin ...	28	37	258	98	75	190	286	142	132	67	892
Goomarin, East	...	173	274	74	85	160	255	98	91	87	776
Southern Cross	...	20	362	221	51	164	228	68	54	68	633

THE SEASON.

Prior to the planting month of May for the 1926 season abnormal rains fell during March and in April frequent showers gave full moisture content to all well-worked fallowed land. Constant attention was able to be given to weed destruction. When the seed was sown immediate germination took place, the seed bed being in a nice warm mellow condition, a vigorous growth followed. During May and June the weather conditions were very mild with beneficial falls of rain and this vigorous growth continued. The plants were too far advanced to be checked by the excessive falls of rain during the latter part of July. August, usually one of the critical months during the growing period, was all that could be desired had the forward growth since seeding received a check. This not being so, the forward plants at the end of this month came into ear. During the early part of September severe frosts were experienced, immediately followed by a sudden rise to abnormally high temperatures for this time of the year, combined with hot north-easterly winds. This variable climatic condition was not beneficial for the forward ears which were going through the setting process. It was not until the third week of this month that beneficial rains fell and relieved this critical period. The latter part of the season saw a great recovery of apparently blighted crops and those later sown.

The results obtained in the different trials are shown hereunder:—

VARIETY TRIALS.

Varieties.	B. W. G. Hopwood, Bencubbin.		E. H. Richards, Southern Cross.		E. Randolph, East Goomarin.		W. Bagshaw. Welbungin.	
	Yield per Plot.	Computed yield per acre per Plot.	Yield per Plot.	Computed yield per acre per Plot.	Yield per Plot.	Computed yield per acre per Plot.	Yiel l per acre.	Computed yield per acre per Plot.
	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.
S.H.J. ...	10 1	20 2	8 40	17 20	5 46	11 32	7 30	15 0
Gluyas Early	9 15	18 30	11 20	22 40	8 25	16 50	9 0	18 0
Noongaar (M.15)	6 1	12 2	8 58	17 56	7 14	14 28	4 35	9 10
S.H.J. ...	10 11	20 22	8 58	17 56	7 3	14 6	4 30	9 0
Gluyas Early	9 50	19 40	10 2	20 4	10 7	20 14	7 30	15 0
Noongaar (M.15)	7 5	14 10	8 32	17 4	8 32	17 4	6 0	12 0

RATE OF SEEDING TRIALS—VARIETY MERREDIN.

Rate of Seed.	B. W. G. Hopwood, Bencubbin.		E. H. Richards, Southern Cross.		W. Bagshaw, Welbungin.		Rate of Seed.	A. G. Reynolds, Mukinbudin.	
	Yield per Plot.	Computed yield per acre per Plot.	Yield per Plot.	Computed yield per acre per Plot.	Yield per Plot.	Computed yield per acre per Plot.		Yield per Plot.	Computed yield per acre per Plot.
	Bus. lb.	Bus. lb.	B. lb.	Bus. lb.	B. lb.	Bus. lb.		B. lb.	Bus. lb.
60	10 26	20 52	7 59	15 58	7 15	14 30	30	6 21	15 52
45	11 15	22 30	7 0	14 0	7 30	15 0	45	3 47	9 27
90	9 3	18 6	4 12	8 24	4 30	9 0	60	3 48	9 30
60	10 5	20 10	5 45	11 30	6 47	13 34	30	5 11	12 57
45	11 13	22 26	5 18	10 36	7 0	14 0	45	5 36	14 0
90	9 57	19 54	3 16	6 32	6 0	12 0	60	4 29	11 12

RATE OF SUPERPHOSPHATE TRIAL—VARIETY MERREDIN.

Rate of Superphosphate.	E. H. Richards, Southern Cross.		E. Randolph, East Goomarin.		A. G. Reynolds, Mukinbudin.	
	Yield per Plot.	Computed Yield per Acre per Plot.	Yield per Plot.	Computed Yield per Acre per Plot.	Yield per Plot.	Computed Yield per Acre per Plot.
	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.	Bus. lb.
150	4 36	9 12	9 43	19 26	2 17	5 42
75	6 38	13 16	10 25	20 50	4 52	12 10
225	5 32	11 4	10 53	21 46	2 43	6 47
150	4 20	8 40	11 53	23 46	3 3	7 37
75	4 10	8 20	10 59	21 40	4 1	10 2
225	1 24	2 48	12 15	24 30	2 14	5 35

SCADDAN DEMONSTRATION PLOTS.

Variety Trial—Wheat.

These plots were carried out on Mr. T. Henchman's property, about four miles west of Scaddan.

Cultural Notes.—Mallee soil; sandy surface; clay sub-soil; rolled down February, 1923; burnt April, 1925; ploughed with 8-furrow disc cultivating plough September, 1925; cross-ploughed with same implement March, 1926; drilled 26th April, 1926. Rate of seed 45 to 50 lbs.; super 110 lbs. per acre. Harrowed after drill.

Variety.	Acreage of Plot.	Yield.	Computed Yield per acre.
	acres.	Bus. lbs.	Bus. lbs.
Fortune	2	35 24	17 42
Nabawa	2	34 42	17 21
Yandilla King	2	32 54	16 27

RATE OF SUPER TRIAL—NABAWA VARIETY.

Rate of Super.	Acreage of Plot.	Yield.	Computed Yield per acre.
	acres.	Bus. lbs.	Bus. lbs.
140lbs.	2	31 22	15 41
210lbs.	2	27 12	13 36
74lbs.	2	26 34	13 17

Oat Trials.

These plots were carried out on Mr. T. Henchman's property about four miles east of Scaddan.

Soil.—Very sandy loam.

Cultural Notes.—Rolled down December, 1924; burnt April, 1925; ploughed with cultivating disc plough September, 1925; cross-ploughed with

same implement March, 1926; harrowed end April, 1926; drilled 3rd May, 1926; seed—40 to 45 lbs.; super—90 lbs. per acre; harrowed after seeding.

Variety.	Acreage of Plot.	Yield.		Computed Yield per acre.	
	acres.	Bus.	lbs.	Bus.	lbs.
Mulga	2	70	13	35	6
Guyra	2	64	38	32	19
Burt's Early	2	54	15	27	7
Algerian	2	35	16	17	28

The Mulga was stripped whilst there were still green patches in the plot not quite ripe. I think this plot would have yielded ever more oats had harvesting conditions been good.

The Guya turned out to be very heavy grain and I was surprised when weighing it.

The Burt's Early was very light grain; there being 215 lbs. of second grade. This plot had shed about a bushel to the acre before stripping commenced.

The Algerian was very smutty during the growing period and perhaps that contributed to cause it to yield so badly.

Everything has two handles, the one by which it may be borne, the other by which it may not. If your brother acts unjustly, do not lay hold of the action of his injustice, for by that it cannot be borne; but by the other, that he is your brother, that he was brought up with you: and thus you will lay hold of the handle which can be borne.—*Epictetus.*

GERALDTON CARNATION WEED.

(*Euphorbia terracina*, Linn.)

W. M. CARNE, F.L.S., and C. A. GARDNER.

Geraldton Carnation Weed is the name locally given to a perennial plant which has spread widely through the townsite of Geraldton, and has caused considerable alarm through the manner in which it has taken possession of the areas it has invaded. The plant comes originally from the Mediterranean region, inhabiting an area with a climate very similar to that of Geraldton. The soil in which it thrives as a native is not known, but in Geraldton it occurs prolifically on poor sandy soils, taking possession where the ground is clear. It has not invaded the areas where the natural vegetation is close.

The weed is only known in Australia from the Geraldton district in Western Australia, and from the Strathalbyn and Yorke Peninsula districts in South Australia. In the latter State, however, it is not regarded as a serious trouble.

The date of introduction into Geraldton is not known, but we know that it was common there in 1914 from the work of the Danish botanist Ostenfeld, and it is curious that it has not been found in the Perth district.

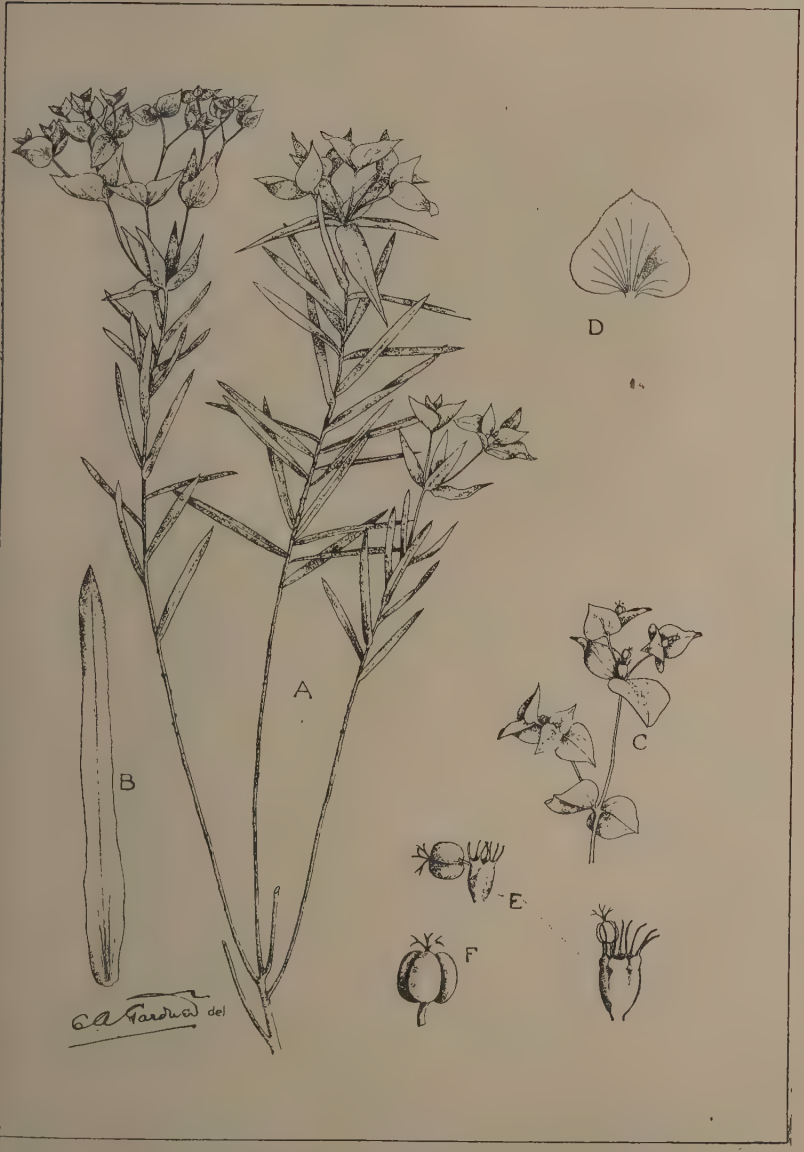
The Geraldton Carnation Weed has no value as fodder plant; in fact, it is stated that it causes a falling of hair from stock which eat it, and its sticky latex (milk) and repulsive smell make it a plant usually avoided by stock. The milky sap of the plant is very acrid and irritating, causing inflammation of the eyes and softer portions of the human body. This is likely to occur when the plants are pulled up by hand and the workers are heated.

The eradication of the weed has presented an unsolved problem to the people of Geraldton. Had radical measures been adopted before 1917 it would have been possible to exterminate it, but the delay which resulted from doubts as to its danger, its possible feeding qualities, and the lack of funds, permitted the weed to spread to an alarming extent within the Geraldton municipality. After some unsuccessful experiments at extermination it was decided to establish and maintain a buffer zone outside the infected area in order that, by keeping this free of the weed, its spread would be checked. This undertaking has proved fairly successful, but requires some vigilance on the part of the authorities concerned, and when necessary the safety zone has had to be pushed out in cases where the weed cannot be coped with. So far the weed has been confined to the sand dunes. Should it appear elsewhere immediate steps should be taken to eradicate all plants seen, particularly before they commence to flower. Although the plant is more or less a perennial it does not spread except by means of seeds, hence the importance of preventing seeding. It has been found at Geraldton that it only spreads freely in open spaces. Whether it is only serious in maritime situations, or would develop in the richer soils further inland, is a matter of conjecture. Its gregarious habits, however, render it a most undesirable plant, and it has been proclaimed as a Noxious Weed for the whole State of Western Australia.

Description of Plant.—A hairless, leafy, pale-green, erect or ascending perennial one to three feet in height. Leaves without stalks to the leaf blade, long and narrow, three-quarters to two inches long, toothed towards the apex. Inflorescence an umbel of four to five rays repeatedly forked; bracts ovate-rhomboidal, with a short point, toothed along the edges; glands greenish, crescent-shaped with slender horns; fruit less than a quarter inch long, three-lobed, smooth; seeds grey and smooth.

Explanation of plate—

A—Habit of plant.
B—Leaf.
C—Inflorescence.
D—Bract.
E—Flower cluster.
F—Fruit.



Geraldton Carnation Weed.
(*Euphorbia terracina*, Linn.)

THE "ROYAL" AND DISTRICT CROP COMPETITIONS.

I. THOMAS,
Superintendent of Wheat Farms.

The Royal Agricultural Society has promoted, during the past four years, competitions for wheat crops of not less than 50 acres of any one variety, amongst the district Agricultural Societies in each of the eight zones into which the Wheat Belt has been divided for the purpose of competition. In each of the eight zones a championship prize is awarded for the best crop, also a second prize is awarded for the runner-up. Those eligible for these prizes being the first and second prize winners of the competitions held by the district Agricultural Societies, provided they are held in accordance with the conditions laid down by the Royal Agricultural Society. These conditions require that the crop shall be grown on fallowed land, shall not be less than 50 acres in area, and shall be judged according to the following scale of points:—

Yield	40
Freedom from weeds	20
Freedom from disease	15
Freedom from admixture ..	15
Evenness of growth	10
Total	100

The judges of the Royal Crop Competitions since their inception have been departmental officers attached to the Wheat Branch, and the same officers have also judged the majority of the district competitions. Previous to last year the Wheat Belt was divided into three zones, distinguished mainly according to differences in average annual rainfall. As it was obviously desirable that all crops in any one zone should be inspected, and the awards for the championship prizes made by the same judge, and as it was the definite and strong wish of many district societies that departmental officers should also continue to judge their competitions, it was decided to re-arrange the zones, and to group together the societies which were adjacent to each other, and which had similar interests and climatic conditions. This required that the Wheat Belt should be divided into eight zones instead of three as formerly.

The eight zones into which the Wheat Belt is divided for the purpose of the competitions are as shown on the accompanying map.

In some districts the Agricultural Societies make no provision for crop competitions, and in order to prevent farmers who live in such districts being debarred from competing for the championship prize in their zones, the Royal Agricultural Society permits such farmers to enter for the competition directly through that society.

The reports and awards made by the respective judges in the different zones are hereunder. The points awarded for yield are not based upon the estimated yield, but upon that calculated from portions of the crop obtained from small areas taken systematically throughout the crop; these portions of the crop are threshed, and the grain weighed.

NORTH
2
1
SOUTH
3
4
CENTRAL
6
5
DIVISION
7
8
INDIAN OCEAN

ZONES 1 AND 2.

(Judge: F. L. SHIER, B.Sc.(Agric.), Agricultural Adviser.)

ZONE 1.

The three entries received by the Royal Agricultural Society were the only competitiors for that society's prizes in this Zone.

The Victoria (Geraldton) District Agricultural Society conducted a crop competition, but as it was not judged according to the scale of points laid down by the Royal Agricultural Society, the competitors in this district's competitions were not eligible for the zone championship prize.

The points awarded are as hereunder:—

ROYAL AGRICULTURAL SOCIETY.

Name.	Address.	Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total 100 points.
Cuming Bros....	Carnamah	Yan. King	38	17	13	13	9	90
Bothe, D. B....	Coorow ...	Nabawa ...	30	19	13	14	8	84
Padbury, W....	Round Hill	Sailor's For.	28	17	14	12	7	78

The winning entry, that of Messrs. Cumings Brothers, was indeed a very fine one. It was portion of a 200-acre paddock of "Yandilla King," and was grown on a heavy forest country. These gentlemen crop a very considerable area of this variety every year, with very consistent good yields.

The crop, which was calculated to yield 38 bushels to the acre, was very dense; it had stooled out well, was very even in height, and with the exception of a little barley grass and a trace of flag smut, was almost a perfect crop. When it was found in the early winter that this crop was becoming too advanced, it was fed back rather heavily but *quickly*. In view of this, the yield obtained must be considered a very fine one.

Mr. D. B. Bothe's crop of "Nabawa," which gained second prize, was also a very creditable entry. It was the first crop on Jam and York Gum country, and was calculated to yield 30 bushels per acre. It was very free from weeds and admixture, but contained a little Septoria. It was slightly uneven as is usual with new ground.

The rainfall, as officially recorded at Carnamah and Coorow, was:—

——	Jan.	Feb.	Mar.	April.	Growing Period.						Total. May to Oct.	Nov.	Dec.	Total.
					May.	June.	July.	Aug.	Sep.	Oct.				
Coorow ...	1	41	48	179	169	315	373	151	139	111	1,258	243	No record	...
Carnamah	...	...	...	229	93	228	360	135	102	88	1,006	No records		...

The methods of cultivation, as adopted by the various competitors, are set out hereunder for comparison:—

ROYAL CROP COMPETITION. Zone 1.

Competitor ...	Cuming Bros., Carnamah.	B. D. Bothe, Coorow.	W. Padbury, Round Hill.
Years cropped	8	1st	3
Timber ...	Salmon and Gimlet	York Gum, Jam and Wattle	York Gum and Salmon
Ploughed ...	July 25, 1925	July 25, 1925	July 25, 1925
Make of Plough	Disc	Disc	Mouldboard
Depth	3½in.	4in.	7
Condition of land at time of ploughing	Good	Good	Good
Other Cultivations	Cross-ploughed with disc springtyned twice	Cultivated, springtyned in September and prior to drilling	Harrowed twice in Spring
Variety ...	Yandilla King	Nabawa	Sailor's Fortune
Planted ...	Second week May	Third week May	End March, with Combine
Rate of Seed	60	60	45
Graded ...	Yes	Yes	Yes
Treated ...	Dry Pickle	Dry	...
Rate of Super.	150	90	120
Disease ...	Trace, Flag Smut and Rust	Trace Septoria	...
Feed off ...			Harrowed after germination. Fed off from first rains until 1st June

A very interesting point in this table is the yield obtained by Mr. W. Padbury, at Round Hill. A yield of 28 bushels was obtaned from "Sailor's Fortune," sown in March, and fed off during the early part of the growing period.

Considering the failure of early sown crops this year, this yield shows the beneficial results to be obtained from feeding off crops which are too far advanced, and also supports the conclusions, already formed, that the failure of the early sown crops this year is due mainly to the time of planting, and not to the variety.

Zone 2.

In this Zone all the entries were through the Dalwallinu Agricultural Society, which was the only society represented in the Zone.

DALWALLINU AGRICULTURAL SOCIETY.

Unfo tunately many of the competition crops of this Zone, which gave promise of good yields in September, were withdrawn owing to the presence of Septoria and consequent diminished yields. This was particularly so in those crops from areas adjacent to the Rabbit-proof Fence, where the disease was accentuated by the early sowing. In some cases it was found that where the Septoria attack was slight, and had normal weather prevailed, good yields would have resulted, but the severe storms of early November

played havoc with the weakened straw, and only moderate yields were obtained. Of the sixteen entrants received by the society, only six remained for final inspection.

The points awarded are as hereunder:—

DALWALLINU AND DISTRICT CROP COMPETITION.

Name.	Variety.	Estimated Yield. 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth. 10 points.	Total 100 points.
Harris, A. T. & Sons	Gresley ...	27	19	14	12	9	81
Bradford Bros.	Gluyas E. ...	27	17	14	13	8	79
Harris, A. T., Junr.	Gluyas E. ...	26	17	14	12	9	78
Court, A. H.	Nabawa ...	23	18	14	14	8	77
McNeill, C....	Gluyas E. ...	25	18	12	12	8	75
Locke, J. H.	Merredin ...	26	16	13	13	7	75

The winning crop of Messrs. A. J. Harris & Sons was of the variety "Gresley," and was calculated to yield 27 bushels per acre. This crop was very even in height, and had stooled well. The heads were well filled. No disease was noticed, but a few wild oats, a little admixture, and a trace of barley were seen.

Messrs. Bradford Bros.' entry of "Gluyas Early," which gained second place, was also a very creditable one, but contained a few wild oats and a sprinkling of mustard. It was not quite so even as the winning crop, but was also very free from disease.

The official rainfall recorded at Dalwallinu is as follows:—

Jan.	Feb.	Mar.	April.	Useful Rainfall.						Total Useful Rain.	Nov.	Dec.	Total Rainfall.
				May.	June.	July.	Aug.	Sept.	Oct.				
4	21	170	143	126	281	337	140	131	135	1,150	127	21	1,636

The details of cultivation adopted by the various competitors are shown hereunder for comparison:—

Competitor ...	A. J. Harris & Sons.	Bradford Bros.	A. J. Harris, jun.
Years Cropped	12	6	10
Timber ...	Salmon, Gimlet and York	Gimlet and Salmon	Salmon, Gimlet and York
Ploughed ...	June 25th	July 25th	July 25th
Make of Plough	Mouldboard	Sundercut	Mouldboard
Depth	3in.	4in.	4in.
Condition ...	Good	Good	Good
Other Cultivations	Springtyned twice. Sundercut September. Mould- just prior to drill	Harrowed after plough. Cultivated Sept., again April, and Combine drill	Sundercut September and prior to drill.
Variety ...	Gresley	Gluyas Early	Gluyas Early
Planted ...	May second week	First week in May	Third week in May
Rate of Seed	55	60	60
Graded ...	Yes	Yes	Yes
Treated ...	Dry	Dry	Dry
Rate of Super.	70	90	70
Disease ...	—		—

Competitor ...	A. H. Court.	C. McNeill.	J. H. Locke.
Years cropped	10	5	7
Timber ...	Morrell, Gimlet, Salmon and scrub	Morrell and Salmon	Gimlet and York
Ploughed ...	July 25th	July 25th	Disc cultivated May 26th
Make of Plough	Mouldboard	Mouldboard	Mouldboard
Depth	4in to 4½in.	4in.	2½in.
Condition ...	Good	Good	—
Other Cultiva-	Springtooth immediately after harrowed four times. Springtooth prior to drill	Crossed with Skim plough Sept. Combine drill	—
Variety ...	Nabawa	Glyuas Early	Merredin
Planted ...	First week in May	Second week in May	Second week in May
Rate of Seed	60	50	50
Graded ...	Recleaned	Yes	Yes
Treated ...	Dry	Dry	Dry
Rate of Super.	60	50	60
Disease ...	—	Ball Smut	Septoria trace

ZONE 3.

Judge: J. H. LANGFIELD, Manager Merredin Experiment Farm.

In this Zone two district societies had arranged competitions; these societies were the Wongan Hills Agricultural Society and the Dowerin Agricultural Society.

WONGAN HILLS AGRICULTURAL SOCIETY.

There were eight competitors in this competition, and some very fine crops were exhibited. The whole of the competing crops were "Nabawa," testifying to the popularity of the variety in this district. In the Dowerin district some very fine crops were noticed on light land, but it is believed that Wongan Hills leads as far as the cultivation of this class of country is concerned. There are many thousands of acres of this class of country in the Wongan Hills district, but it is understood that it is all taken up; some cropped, whilst large areas are laying in fallow for the coming year. The crops on this class of land are very encouraging, and many were noticed that should yield well.

The awards made are as hereunder:—

WONGAN HILLS AND DISTRICT CROP COMPETITION.

Name.	Variety.	Estimated Yield. 40 points.	Freedom from Weeds, 20 points	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth. 10 points.	Total 100 points.
Ackland, R. B.	Nabawa ...	32	18	14	14	8	86
Booth, W. J.	Nabawa ...	33	17	14	13	8	85
Ackland, J. H.	Nabawa ...	24	18	14	13	8	77
Parker, A. E.	Nabawa ...	27	16	12	13	8	76
Parker, C.	Nabawa ...	26	16	13	13	8	76
White, J.	Nabawa ...	24	18	12	14	7	75
Spencer & Son	Nabawa ...	24	16	14	13	7	74
Gorman, P. W.	Nabawa ...	19	19	14	14	7	73

Mr. R. B. Ackland's crop was very thick; there was very little admixture, and the only weeds were some Cape weeds which had been missed when cultivating, and had developed into very big plants; otherwise the crop was very clean. There was a depression running through one part, which accounted for most of the uneveness. It was seeded in May at the rate of 60 lbs. and 128 lbs. of superphosphate. It was ploughed in June; cultivated in August, September, March, and April, and seeded with a "Combine" with light harrow attached.

Mr. Booth's crop was also an excellent one. The land was ploughed in July, and was not cultivated until March. The seed was sown in April with a "Combine" at the rate of 58 lbs. per acre, with superphosphate at the rate of 60 lbs. per acre. There was a fair number of weeds in places, mostly mustard, also a few small patches of takeall. A small depression ran through one end, otherwise it was very even. There was very little admixture.

Mr. J. H. Ackland's crop was not so heavy as the first two. The land had been ploughed in July, cultivated three times in spring with a "Springtyne," and then with a "Sundercut" before drilling. The seed was planted about the middle of May, at the rate of 45 lbs., and superphosphate 112 lbs. per acre. There were a few small patches of take-all and some admixture, which appeared to be "Federation."

Mr. A. E. Parker's crop was also very heavy, and had suffered considerably from the heavy rain which had fallen the day before inspection. Some places were very tangled, and would be very difficult to harvest. It was ploughed in July, cultivated three times and harrowed once, and was sown with a "Combine," the rate of seed being 60 lbs. and the superphosphate 83 lbs. per acre. Take-all was very prevalent, and there was also a fair amount of weed growth, mostly mustard and wild radish.

The land for Mr. C. Parker's crop was part summer fallowed (February, 1925,) and the balance winter fallowed (July, 1925); it was cultivated in September and October, and harrowed in March. The seed was sown with a "Combine" about the middle of May at the rate of 58 lbs. and superphosphate 90 lbs. per acre. Take-all was fairly prevalent, and there were a few "strangers" which appeared to be "Federation"; it contained a fair amount of weed growth, mostly mustard and cockspur.

Mr. Spencer's land was ploughed in July, cultivated twice in spring, and then sown with a "Combine" the first week in May at the rate of 48 lbs. and superphosphate 100 lbs. per acre. The crop was fairly tall, and was considerably knocked about by the recent rain and wind. There was a fair percentage of weeds, mostly cockspur and Cape weed; there were also a few blighted patches with dummy ears.

Although last on the list Mr. Gorman's crop was, perhaps, the most interesting, as it was on pure sandplain, which had been fallowed with a disc plough. It was sown in May at the rate of 45 lbs. of seed per acre, and 100 lbs. of superphosphate per acre. Being new land and sandplain it was practically free from weeds, with very little or no disease, and very free from admixture.

The rainfall, as recorded on the properties of two of the competitors, was as follows:—

— —	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
Ackland, R. B. ...	*Nil*	16	149	160	241	235	475	234	138	151	1,799
Spencer & Sons ...	31	47	122	187	160	233	476	224	139	173	1,792

DOWERIN AGRICULTURAL SOCIETY.

There were eight competitors in this competition, commencing from Ejanding and extending as far as Dukin and Wyalcatchem.

The crops exhibited were a very fine even lot, and will yield considerably more than the average for the district; this proves that by adopting better methods the average for the district can be greatly increased.

The rainfall in the area over which the competition is spread varies somewhat; around Dowerin, Minnivale, and Wyalcatchem the average annal rainfall is about 15 inches, and from 10 to 12 inches of this falls in the growing period; towards Booralaming the rainfall is not so good, whilst at Dukin there is a falling off from two to three inches. It will, therefore, be seen that some of the competitors are rather at a disadvantage as regards rainfall, although in wet years they will show to advantage. From Dowerin to Wyalcatchem the rainfall is ideal for wheat growing, and provided the land is well fallowed, the limiting factor cannot be said to be lack of moisture. The rainfall in the district, as recorded on the farms of Messrs. J. H. Hughes and H. E. Bear, Minnivale, was as follows:—

——	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sept.	Oct.	Total, April to Oct.
Hughes, J. H. ...	15	36	157	154	138	182	407	114	130	118	1,243
Bear, H. E. ...	6	92	151	138	148	174	353	96	99	103	1,111

The awards made are as hereunder:—

DOWERIN AND DISTRICT CROP COMPETITION.

Name and Address.	Variety.	Estimated Yield. 40 points.	Freedom from Weeds, 20 points	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth. 10 points.	Total 100 points.
O'Loughlin, M. J., Minnivale ...	Sailor's For.	28	18	14	14	8	82
Bear, H. E.	Nabawa ...	27	18	12	14	8	79
Hughes, J. R., Minnivale ...	Sailor's For.	26	18	14	14	7	79
Jones, A., Ejanding	Nabawa ...	23	19	13	14	9	78
Lindsay, J., Wyalkatchem ...	Gluyas E. ...	25	18	12	14	7	76
Hewton, A. W., Benjaberring ...	Nabawa ...	22	18	14	13	7	74
Best, R. T., Booralaming ...	Nabawa ...	22	17	13	14	7	73
Lehmann, C. H., Dukin ...	Merredin ...	21	17	14	14	7	73

The winning crop in the competition was that of Mr. M. J. O'Loughlin. This, I understand, is the first time that he has competed, and it is indeed pleasing to see new blood coming in and successfully competing against older competitors. There were very few weeds in this crop, and very little admixture or disease, an odd small patch of "take-all" being the only disease noticed.

Mr. Bear's crop was "Nabawa," which was planted early in May, the rate of seed being 50 lbs. and superphosphate 90 lbs. per acre. This crop was very even and free from admixture; there were very few

weeds, and the only disease noticeable was some small patches of "take-all." Most of the crop on Mr. Bear's farm was very similar to the competition one.

Mr. Hughes' crop was also "Sailor's Fortune," sown with 45lbs of seed and 112 lbs. of superphosphate per acre. It was exceptionally heavy in places, but fell away on the Northern side. It had an odd small patch of "take-all," but otherwise appeared free from disease; there were very few weeds, a few wild oats being noticed in one or two places; it was also very free from admixture, an odd ear of another variety only being noticeable. Mr. Hughes puts up his 50-acre block very well, having it properly defined by a binder cut, which makes it very much easier for the judge, instead of wandering into a two or three hundred acre paddock, without a peg being put up, and being told it will run so many chains one way and so many the other. Mr. Hughes' crop and his average yield should be fairly high.

Mr. Jones' crop was "Nabawa," planted about the end of May with seed from 60 to 65 lbs. and superphosphate 140 lbs. per acre. The crop was short, but very well headed and very even; contained some ball smut (the seed had not been pickled), was very free from weeds, and had scarcely any admixture.

Mr. Lindsay's crop was "Glynn Early," which had lodged very badly, and they were finding difficulty in harvesting it. It contained very few weeds and admixture, but there was a fair amount of "take-all."

Mr. Best's crop was "Nabawa," sown in May at the rate of 56 lbs. of seed and 90 lbs. of superphosphate per acre. It was very free from admixture, but rather uneven.

Mr. Heaton's crop was "Nabawa," portion of which was sown early, and the balance late in May. The early sown part was going down rather badly, whilst the later sown was standing well, and from appearances the late sown portion would yield equally as well as that sown earlier. The seed was planted at the rate of 60 lbs. with 90 lbs. superphosphate per acre. There was very little disease, a few blighted ears being noticed in the early sown portion; there were very few weeds, and it was fairly free from admixture.

Mr. Lehmann's crop was "Merredin," which was rather uneven and knocked about by rabbits. It was planted the last week in May with seed at the rate of 58 lbs. per acre and superphosphate 80 lbs. per acre.

The general rate of seeding in the competition is between 50 and 60 lbs. per acre; the lowest quantity of superphosphate used was 80 lbs. and the highest 140 lbs. per acre. The absence of sheep on many farms was reflected by the very dirty condition of the fallow, but farmers fully realise the important part sheep play on the wheat farm, and are erecting fences with a view to stocking at an early date.

ZONES 4, 7, AND 8.

Judge: H. Rudall, Field Officer.

In touring the Wheat Belt at the period when crops entered in the 50-acre competitions are ready for judging, one is yearly impressed that the institution of these competitions has been a leading factor, not only in improving agricultural methods, but also in making vast areas and resources of the districts widely known.

Perhaps the most noticeable feature in cereal-growing throughout the areas, is the yearly increase in fallowing and the careful attention paid to cultivating the fallows, more particularly during the spring and after summer rains. Annually the "fallow barometer" is rising higher and higher, which will react on the State's yearly average.

A year ago a timely warning was sounded relating to a certain district in connection with the continued rotation of fallow, wheat, fallow, wheat, perhaps being continued a little too long, thereby impoverishing the soil and diminishing the yield. Other areas should now consider if, by this continued rotation, their soils are not being depleted of the humus so necessary to maintain the fertility of their older paddocks, and whether a longer rotation, so as to include a pasture or fodder crop, would not be beneficial in restoring the humus so necessary to fertility.

A larger amount of "take-all" was encountered this season than any previous one. It is to be hoped that farmers are not getting careless in their endeavour to check this disease. The question has been asked, "Whether the grain harvested near the affected parts would be affected with the spores of this disease?" My reply is "No." This parasitic fungus lives on the base of the stems and roots of the wheat plant, and as the badly affected plants do not form heads of grain, the chances are that the grain harvested from near the affected parts and used for seed, are not affected with the spores of the disease. The stubble left after harvesting an affected wheat crop is a likely cause of infection or spreading of the disease. One main step for its eradication should be the burning of the stubble. One has seen very clean stubble "burns" over paddocks that contain affected patches; on examination it has been found that the affected patches have not been thick enough to burn, but all around the unaffected stubble has been cleaned up. It might be an advantage if some of the thicker stubble was gathered and scattered over the affected patches to ensure the fire passing over them on a face, to burn the short stems and base of the affected plants.

From fields that came under notice there is already a severe toll being paid by the spread of this disease, and it will take a longer rotation than "fallow and wheat" to eradicate it completely. Late fallowing, and ploughing in much straw, may encourage the disease, but early fallowing and systematic cultivation of the soil will improve its mechanical condition to check the spread of this "toll demanding fungus."

ZONE 4.

NUNGARIN AGRICULTURAL SOCIETY.

The awards were as follows:—

NUNGARIN AND DISTRICT CROP COMPETITION.

Name and Variety.	Estimated Yield. 40 points.	Freedom from Weeds, 20 points	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points	Evenness of Growth. 10 points.	Total 100 points.
Young, G. T.—Nabawa	28	18	14	14	8	82
Williams, F. A.—Nabawa	28	17	14	14	8	81
Creagh, Bros.—Nabawa	27	17	14	14	8	80
Fitzpatrick, R. C.—Nabawa	23	17	14	13	8	75
Dumsday, L.—Nabawa	20	16	14	13	8	71
Field, R. A.—Nabawa	21	16	13	12	7	69
Reynolds, A. G.—Nabawa	18	16	13	13	7	67
Corunna, A.—Gluyas Early	17	16	13	12	6	64

The methods of cultivation adopted by the competitors are set out in the table hereunder:—

NUNGARIN DISTRICT CROP COMPETITION. Zone 4.

Competitor.	Young, G. T.	Williams, F. A.	Creagh Bros.	Fitzpatrick, R. C.
Years Cropped	Two crops	14 years	...	Three crops
Years Fallowed	One fallow	...	...	One fallow
Timber ...	Salmon and gimlet	Salmon and gimlet	...	Jam, mallee and little York Gum
Ploughed ...	First week July, 1925	June, 1925	July and August, 1925	June, 1925
Make of Plough	State, 8 Disc	Shearer, Mouldboard	State, 8 Fur Disc	State Cultivating plough
Depth	4in.	4in.	4in.	4in.
Condition of land at time of ploughing	Good	Wet	Good	Good
Other Cultivations	Cultivated with Springtyne in September, later harrowed; Springtyned end of April	Cultivated with Sundercut in August; harrowed in September, October and January; Springtyned in February and April	Springtyned in September and February; harrowed in March; harrowed behind drill.	Springtyned in September; harrowed before and after seeding.
Variety ...	Nabawa	Nabawa	Nabawa	Nabawa
Planted ...	First week in May	First week in May	End of April	First week in May
Rate of Seed	45	45	45	60
Graded ...	Graded	No	Rewinnowed	Yes
Treated ...	Dry method	Dry method	Not treated	Not treated
Rate of Super.	80	70	80	100
Disease ...	...	...	...	...

NUNGARIN DISTRICT CROP COMPETITION—*continued.*

Competitor.	Dumsday, L.	Field, R. A.	Reynolds, A. G.	Corunna, A.
Years Cropped	Two crops	Not cropped	Two crops	Four crops
Years Fallowed	One fallow	First fallow	One fallow	One fallow
Timber ...	Salmon, Gimlet and Morrell	...	Gimlet, Salmon and Mallee	Morrell and Salmon
Ploughed ...	June, 1925	July	June	September
Make of Plough	Shearer, 10-furrow Disc	Shearer, 4-furrow Mouldboard	Federal, 10-furrow Disc	Sundercut
Depth	3in.	4½in.	4in.	3in.
Condition of land at time of ploughing	Good	Good	Good	Good
Other Cultivations	Springtyned August; harrowed end of August; harrowed February and March	Springtyned November; harrowed prior to seeding	Springtyned early in August, redisced in September; harrowed in March; harrowed after drill	Harrowed end of April
Variety ...	Nabawa	Nabawa	Nabawa	Gluyas Early
Planted ...	End of May	Middle of May	End of April	End of April
Rate of Seed ...	45	60	43	45
Graded ...	Yes	Rewinnowed	Rewinnowed	Not graded
Treated ...	Dry method	Not treated	Dry method	Half treated with formalin
Rate of Super.	95	96	80	60
Disease ...	...	Flying smut	Little smut	Trace smut, little flying smut

The rainfall, as recorded at Nungarin, was:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
12	80	229	80	117	190	302	126	130	101	966	33	21	1,341

MT. MARSHALL AGRICULTURAL SOCIETY.

The awards were as follows:—

MOUNT MARSHALL DISTRICT CROP COMPETITION.

Name and Variety.	Estimated Yield. 40 points.	Freedom from Weeds, 20 points	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth. 10 points.	Total 100 points.
Webster and Pratt—Nabawa	25	18	14	13	8	78
Hopwood, B. W. G.—Gluyas Early ...	24	18	12	13	8	75
Green, A. E.—Nabawa	23	17	14	12	7	73
Weyman, F. C.—Nabawa	21	17	13	13	7	71

The methods of cultivation adopted by the competitors are set out in the table hereunder:—

MT. MARSHALL DISTRICT CROP COMPETITION. Zone 4.

Competitor ...	Webster & Pratt.	Hopwood, B. W. G.	Green, A. E.	Weyman, F. C.
Years Cropped	Three crops	Six crops	Four crops	...
Years Fallowed	One fallow	Four fallows	One fallow	...
Timber ...	Mallee and Scrub	Gimlet and Mallee	Mallee, Gimlet, Salmon, Titree	...
Ploughed ...	June	July	Late in August	July
Make of Plough	McKay Sundercut	Sundercut	Shearer Disc	Shearer Disc
Depth	3½in.	4in.	3½in.	4in.
Condition of land at time of ploughing	Good	Good	Fairly dry	Good
Other Cultivations	Springtyned in August, September, December, February, and April	Springtyned in September. Tandem disc harrowed in November. Springtyned in January, lightly disced ploughed in February, springtyned in March	Springtyned end November .	Harrowed in April
Variety ...	Nabawa	Gluyas Early	Nabawa	Nabawa
Planted ...	First week May	End of May	Second week April	Second week May
Rate of Seed...	55	45	45	45
Graded ...	Rewinnowed	Yes	Yes	Yes
Treated ...	Formalin	Untreated	Untreated	Untreated
Rate of Super.	80	100	100	100
Disease ...	...	Flag Smut	...	Flying Smut

The rainfall as recorded at Bencubbin, (the nearest official station), is shown hereunder:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
41	70	296	84	86	208	265	116	89	85	849	60	48	1,448

ZONE 7.

KULIN DISTRICT CROP COMPETITION.

The awards were as follows:—

KULIN AND DISTRICT CROP COMPETITION.

Name and Variety.	Estimated Yield 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth 10 points.	Total, 100 points.
Bowey, P. J.—Queen Fan	25	18	12	12	8	75
Gray, J. S.—Queen Fan	25	17	12	13	7	74
Freebairn, F. S.—Queen Fan	26	17	11	12	6	72
Trotter, A. W.—Nabawa	23	16	13	13	6	71
Weaver, A. J.—Queen Fan	24	17	11	11	6	69
McGrath, M.—Queen Fan	22	16	10	12	6	66
Meikle, P.—Queen Fan	21	16	10	12	6	65
Johnstone, E. B.—Nabawa	14	14	12	13	5	58

The methods of cultivation adopted by the competitors are set out in the table hereunder:—

KULIN DISTRICT CROP COMPETITION.

Zone 7.

Competitor ...	Bowey, P. J.	Gray, J. S.	Freebairn, F. S.	Trotter, A. J.
Years Cropped and Fallowed	Unknown	Unknown	Unknown	3 crops ; 2 fallows
Timber ...	Salmon	—	Unknown	Jam, Salmon, York Gum
Ploughed ...	Late in July	September	Unknown	End of June
Make of Plough	Shearer Mouldboard	International Mouldboard	Unknown	Shearer 10-Disc
Depth ...	3in.	4in.	Unknown	3in.
Condition of land at time of ploughing	Fairly good	Dry and hard	Unknown	Good
Other Cultivations	Heavy harrowed beginning Oct. Cross harrowed in March	Springtyned Feb., April, and prior to drilling	Unknown	Cross disced end of August. Springtyned Jan. and April
Variety ...	Queen Fan	Queen Fan	Queen Fan	Nabawa
Planted ...	First week in May	Middle of April	Middle of April	Middle of May
Rate of Seed ...	60	55	60	60
Graded ...	No	Yes	No	Yes
Treated ...	Dry method	Dry method	Bluestone	Dry method
Rate of Super.	80	95	90	90
Disease ...	Takeall	Takeall	Takeall	—

KULIN DISTRICT CROP COMPETITION—*continued.*

Zone 7.

Competitor ...	Weaver, A. J.	McGrath, M.	Meikle, P.	Johnstone, E. B.
Years Cropped and Fallowed.	3 crops, 1 fallow	4 crops, 2 fallows	4 crops, 2 fallows	2 crops, 1 fallow
Timber ...	Jam, Salmon, York Gum	Gimlet, Salmon and Mallee	Salmon, Gimlet, Mallee	Mixed
Ploughed	End of July	Middle of June	July	July
Make of Plough	Shearer Disc	Shearer Mouldboard	State Disc	Smith Mouldboard
Depth ...	3½in.	4in.	4in.	3in.
Condition of land at time of ploughing	Fairly good	Good	Fairly good	Good
Other Cultivations	Springtyned Oct. and prior to drilling	Disc cultivated in Sept. Springtyned Jan. and March. Lightly disced before seeding. Harrowed after drilling	Cross disced in August. Springtyned Oct. and prior to seeding	Disc cultivated in Sept. Springtyned Dec., Feb., and before drilling.
Variety ...	Queen Fan	Queen Fan	Queen Fan	Nabawa
Planted ...	First week in May	First week in April	Second week in April	First week in May
Rate of Seed ...	60	60	50	45
Graded ...	Rewinnowed	Rewinnowed	Rewinnowed	Yes
Treated ...	Dry method	Bluestone	Bluestone	Dry method
Rate of Super.	90	75	80	100
Disease ...	Takeall	Takeall, Flying Smut, Flag Smut	Takeall	Trace Takeall

The rainfall recorded at Kulin was:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total. May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
...	24	270	104	213	182	497	151	149	132	1,324	119	32	1,873

ZONE 8.

GNOWANGERUP AGRICULTURAL SOCIETY.

The awards were as follows:—

GNOWANGERUP DISTRICT CROP COMPETITION.

Name and Address.	Variety.	Estimated Yield.	Freedom from Weeds.	Freedom from Disease.	Freedom from Admixture.	Evenness of Growth.	Total.
	Points.	40	20	15	15	10	100
Parkinson, A. W., Gnowangerup	Yan. King ...	37	18	13	13	7	88
McDonald, J., Gnowangerup ...	Nabawa ...	33	17	13	12	7	82
Allardyce, A. H., Gnowangerup ...	Nabawa ...	30	17	13	12	7	79

The methods of cultivation, as adopted by the competitors, are as hereunder:—

GNOWANGERUP DISTRICT CROP COMPETITION.

(Zone 8.)

Competitor ...	Parkinson, A. W.	McDonald, J.	Allardyce, A. H.
Years Cropped	First Crop; First Fallow	Tenth Crop; Third Fallow	Fourth Crop; First Fallow
Timber ...	Jam, Morrell, York Gum	Salmon, Morrell and York Gum	Morrell
Ploughed ...	July	August	End of August
Make of Plough	Smith Mouldboard	Stare Mouldboard	Shearer Mouldboard
Depth ..	3½ to 4 inches	4 inches	3 inches
Condition of land at time of ploughing	Good	Good	Very fair
Other Cultivations	Harrowed immediately after ploughing. Disc ploughed end August. Harrowed September and early November; Springtyned March and end of April	Springtyned September. Harrowed November. Springtyned February. Skim ploughed and harrowed prior to seeding	Harrowed September. Disc ploughed, first week November. Skim ploughed March. Followed by Springtyne
Variety ...	Yandilla King	Nabawa	Nabawa
Planted ...	First week in May	Second week in May	Third week in May
Rate of Seed ...	45	52	56
Graded ...	Yes	Rewinnowed	Rewinnowed
Treated ...	Formalin	Formalin	Dry method
Rate of Super.	100	85	75
Disease ...	...	...	...

The rainfall recorded at Gnowangerup was:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
14	55	203	203	155	194	454	111	145	168	1227	65	114	1,881

ZONE 8.

ROYAL AGRICULTURAL SOCIETY.

In the absence of a society competition, the entries in the Gillimanning districts were made through the Royal Agricultural Society. The award is as follows:—

ROYAL AGRICULTURAL SOCIETY, ZONE 8.

Name.	Address.	Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
Elliott Bros. ...	Gillimanning	Lotts ...	30	17	13	12	7	79
Clifford. M. ...	Gillimanning	Federation	15	17	13	12	7	64

The methods adopted by the competitors were as shown hereunder:—

ROYAL CROP COMPETITION.

Competitor.	Elliott Bros.	M. Clifford.
Years Cropped	Three crops; One Fallow	Four Crops; Four Fallow
Timber ...	York Gum, Jam	York Gum, Jam
Ploughed ...	End of August	Early in August
Make of Plough	McKay Mouldboard	Tregurtha & Hughes Mouldboard
Depth	3½in.	5in.
Condition of land at time of Ploughing	Good	Hard
Other Cultivations	Springtyned second week in October and first week in April	Springtyned September, March and prior to seeding
Variety ...	Lotts'	Federation
Planted ...	Middle April	Second week in May
Rate of Seed	60	75
Graded ...	Rewinnowed	Graded
Treated ...	Formalin	Dry method
Rate of Super.	80	120
Disease	...	...

The rainfall recorded at Wickepin, the nearest official station to Gillimanning was:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
26	16	397	189	243	262	571	137	236	195	1,644	78	51	2.401

ZONES 5 AND 6.

Judge: I. THOMAS, Superintendent of Wheat Farms.

The total entries received from the different agricultural societies in Zone 5 numbered 75, and one was also received by the Royal Agricultural Society; of the total number 47 submitted their crops for inspection. It was not surprising that such a number withdrew from the competition in view of the adverse weather conditions which were experienced during the critical growing period in September, and from which the wheat crops suffered. The withdrawal of so many crops, because of unfavourable climatic conditions, adds additional credit to those who remained, for they also experienced the same adverse conditions, and despite these, were able to obtain yields as high as 30 bushels per acre. This is very creditable, and indicates that the methods adopted are on sound lines.

The crops inspected were, generally speaking, free from smut, although a few badly infected crops were noticed. The most popular method of treating the seed for the prevention of smut is the dry method with copper carbonate; when correctly applied this method is effective in preventing the disease, it also has the additional advantage that the seed can be treated immediately after harvest, and when treated the copper carbonate acts as a preventive against vermin. Although the majority of the competitors adopted the dry method, all of those who used it were not successful. The highly satisfactory results which many have obtained with this treatment indicate that failure with it is due to some defect in the methods of treating the seed. Effective results can only be obtained when the seed is dusted thoroughly with the powder. Those using the machines for treating the seed are sometimes inclined to treat the work as a "rush" job, and in consequence the grain is not covered as thoroughly as it should be.

The disease Flag Smut was noticed in several of the crops. It is more difficult to control than Ball Smut or Bunt, because the disease is transmitted through soil infection, and distributed, as a result of the spores on the foliage of the wheat plant being blown about. To control this disease it is advisable to plant varieties like "Nabawa," which are highly resistant to it. As an additional precaution, and particularly when resistant varieties are not available or are unsuitable, the land for the next crop should be fallowed in the early winter months—June, July—and all weed growth which may appear on the fallowed land destroyed, either by sheep or by cultivation. It is also advisable where possible to grow a crop of oats between the two crops of wheat.

Some crops were also attacked by the disease "Take-all." Unfortunately no variety is known to be resistant to this disease, and its control, therefore,

depends entirely upon the cultural methods adopted. These methods are similar to those already recommended for the control of Flag Smut. In addition, planting late in the sowing period is beneficial. Early fallowing and late sowing should, therefore, be the methods adopted to control this disease.

TAMMIN AGRICULTURAL SOCIETY.

Ten entries were received for this competition, four of which withdrew prior to inspection.

The awards made are set out in the table hereunder:—

TAMMIN AND DISTRICT CROP COMPETITION.

Name and Variety.	Estimated Yield. 40 points.	Freedom from Weeds, 20 points	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth. 10 points.	Total 100 points.
Cooke, H. F.—Nabawa	29	18	13	13	8	81
Uphill, G.—Gluyas Early	25	18	12	14	9	78
Hocking, H. R.—Nabawa	25	18	13	14	7	77
Machin, C. C. and Sons—Nabawa	24	17	13	13	8	75
Thompson, W. H.—Nabawa	21	16	11	13	8	69
Tremlett, W. H.—Nabawa	19	16	9	13	6	63

The winning crop of 50 acres was the best of a field of 250 acres of the same variety, "Nabawa." It was well grown and fairly uniform in height, and had stooled evenly. A little Take-all and a little loose smut were noticed, also an odd plant of mustard; otherwise it was free from weeds, and except that a narrow strip of another variety butted on to the competition area, it was free from admixture.

The second prize crop was 50 acres of "Gluyas Early," being part of 325 acres of the same variety. Flag Smut was noticed, otherwise it presented a better appearance than the winning crop, although the yield was not so high.

The rainfall, as officially recorded at Tammin, was:—

Jan.	Feb.	Mar.	April.	Growing Period. May.	June.	July.	Aug.	Sep.	Oct.	Total, May to Oct.	Nov.	Dec.	Total.
3	12	239	204	118	218	540	167	132	137	1,312	112	No record	...

The methods of cultivation adopted by the competitors are set out in the table herewith:—

TAMMIN DISTRICT CROP COMPETITION.

(Zone 5.)

Competitor ...	H. R. Hocking.	W. H. Tremlett	Machin & Sons.
Years Cropped	Fourth	Seventh	Third
Timber ...	Gimlet and Mallee	Mallee, Salmon Gimlet and Ti-tree	Salmon and Gimlet
Ploughed ...	Late June and early July	July	August
Make of Plough	Mouldboard	Mouldboard	Mouldboard

TAMMIN DISTRICT CROP COMPETITION—*continued.*

(Zone 5.)

Competitor.	H. R. Hocking.	W. H. Tremlett	Machin & Sons
Depth ...	3½ inches	3½ to 4 inches	4 inches
Condition of land at time of ploughing	Good, but turned up cloddy in patches	Good	Good
Other Cultivations	Cross-cultivated with Springtyne in Sept., in early March, and before seeding	Cultivated twice in Aug., Sundercut last week in May to 3 inches	Sundercut in April. Planted with Combine
Variety ...	Nabawa	Nabawa	Nabawa
Planted ...	23rd and 27th April	Last week in May	10th and 20th May
Rate of Seed ...	45 to 50lbs.	60	60
Graded ...	Yes	Yes	Yes
Treated ...	No	Yes (Dry)	Yes (Dry)
Rate of Super	93	70	70
Disease ...	Takeall	Smutted badly	Trace Takeall

TAMMIN DISTRICT CROP COMPETITION—*continued.*

(Zone 5.)

Competitor ...	H. F. Cooke.	G. Uphill.	W. Thompson.
Years Cropped	Fourth	Second or Third	...
Timber ...	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet, with a little Morrell
Ploughed ...	July	July and August	July
Make of Plough	Sundercut	Mouldboard	Mouldboard
Depth ...	Three inches	Three inches	Four inches
Condition of land at time of ploughing	Good	Good	Good
Other Cultivations	Cross Sundercut in Aug., Springtyne in March	Cultivated in September	Sundercut in September, Springtyne in October, March and May, in front of Combine
Variety ...	Nabawa	Gluyas Early	Nabawa
Planted ...	End of April	Second week in May	1st week in May
Rate of Seed ...	50	50	50
Graded ...	Yes	Re-cleaned	Re-cleaned
Treated ...	No	Yes (Dry)	Yes (Dry)
Rate of Super.	75	90	90
Disease	Takeall and loose Smut slightly	Trace Flag Smut	Septoria bad on stem, causing Crop to go down. Takeall patches

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY.

Sixteen entries were received for this competition, four withdrew, and two were disqualified because the competing crops were not on fallowed lands (one of the conditions of the Royal Agricultural Society's competition).

The awards made are set out in the table hereunder:—

DOODLAKINE AND BAANDEE CROP COMPETITION.

Name and Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth 10 points.	Total, 100 points.
Barton, R. and Sons—Gluyas Late... ...	27	18	14	12	8	79
Barnes, F.—Gluyas Early	27	18	10	13	9	77
Spillman, J. W.—Merredin	20	19	13	13	8	75
Wendt, V.—Nabawa	24	16	10	12	7	69
Spillman, D. J.—Merredin	20	16	12	12	8	68
Evans, W. L. —Canberra	22	16	9	11	9	67
Connolly, T.—Merredin	23	16	8	12	8	67
Prowse, A. E. C.—Gluyas Early	19	12	12	14	7	64
Mather, J.—Canberra	20	14	11	12	7	64
Colliver, S. G.—Gluyas Early	20	14	10	11	6	61

The prize-winning crop was part of 240 acres of "Late Gluyas." It was fairly free from disease, weeds, and admixture, although a little barley was noticed; it was fairly even in height, but the stooling was irregular.

The second prize crop was part of 100 acres of "Gluyas Early." This was fairly free from weeds and admixture, was uniform in height, and had stooled evenly. Ball Smut was very prevalent in one strip, which indicated that it had been sown with untreated seed. A little Take-all was also present.

The rainfall at Baandee and Doodlakine was recorded as hereunder:—

—	Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Total
					May.	June.	July.	Aug.	Sep.	Oct.				
Baandee ...	...	...	194	75	77	144	340	87	74	68	790	22	No record	...
Doodlakine	13	13	240	124	118	193	343	118	111	101	984	38	10	1,422

The methods of cultivation adopted by the competitiors are set out in the table hereunder:—

DOODLAKINE BAANDEE DISTRICT CROP COMPETITION.

(Zone 6.)

Competitor.	F. Barnes.	T. Connolly.	S. G. Colliver.	V. Wendt.
Years cropped	...	Unknown	Unknown	Eight
Timber ...	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	July and August	July	July	June to July
Make of Plough	Mouldboard	Mouldboard	Disc	Mouldboard and Disc

DOODLAKINE-BAANDEE DISTRICT CROP COMPETITION—*continued.*

(Zone 6.)

Competitor.	F. Barnes.	T. Connolly.	S. G. Colliver.	V. Wendt.
Depth	3in. to 4in.	4in.	3in. to 3½in.	3in.
Condition of land at time of ploughing	Good	Good	Good	Good
Other Cultivations	Cultivated after ploughing and in March after rain	Partly cultivated in March. Balance not touched	Cultivated in September and April after rain. Planted with Combine	Cultivated in August and harrowed in September and November. Planted with Combine
Variety ...	Gluyas Early	Merredin	Gluyas Early	Nabawa
Planted ...	Second week in May	End April	Middle of May	Last week in April
Rate of Seed	60	60	45	50
Graded ...	Recleaned	Recleaned	Recleaned	Recleaned
Treated ...	Yes (dry)	Yes (dry)	Yes (dry)	Yes (dry)
Rate of Super.	80	70	80	70
Disease ...	Smut and Takeall fairly bad	Smut bad and a a little Takeall	Loose Smut, Flag Smut and Takeall in patches	Takeall in patches. Touch Flying Smut

DOODLAKINE-BAANDEE DISTRICT CROP COMPETITION—*continued.*

(Zone 6.)

Competitor.	W. L. Evans.	A. E. C. Prowse.	J. Mather.	Barton & Sons.
Years cropped	Twelve	Ten	Second	Second
Timber ...	Salmon and Gimlet	Salmon and Gimlet	Jam and York Gum	Salmon, Gimlet, York Gum and Mallee
Ploughed ...	Early August	Late in July	Late in July	July and August
Make of Plough	Disc	Mouldboard	Mouldboard	Disc
Depth ...	3½in. to 4in.	4in.	4in.	4in.
Condition of land at time of ploughing	Setting hard	Good	Good	Good
Other Cultivations	Cultivated March after rain. Skim ploughed before seeding	Cultivated September and ahead of Combine	Cultivated prior to planting with Combine	Part skimmed with Mouldboard and part disced in September. Cultivated and harrowed ahead of drill
Variety ...	Canberra	Gluyas Early	Canberra	Late Gluyas
Planted ...	Third and fourth week in May	Middle of May	7th to 11th May	First and second week in May
Rate of Seed...	60	45	66	60
Graded ...	Recleaned	Recleaned	Yes	Yes
Treated ...	Yes (dry)	No	Yes (dry)	Yes
Rate of Super.	90	72	90	80
Disease ...	Ball, Flag and Flying Smut. Trace Rust and Takeall	Flag and Ball Smut a trace. Few patches Takeall	Trace of Flag and Ball Smut. Rust slightly	

DOODLAKINE-BAANDEE DISTRICT CROP COMPETITION—*continued.*

(Zone 6.)

Competitor.	Spillman, D. J.	Spillman, J. W.
Years Cropped ...	Fourth	Third
Timber	Gimlet and York Gum and Boree	White Gum, Gimlet and Mallee
Ploughed ...	August	July
Make of Plough	Mouldboard and Disc	Disc Cultivator
Depth	3in. to 4in.	4in.
Condition of land at time of ploughing	Good	Good
Other Cultivations	Planted with Combine	Disc cultivated in September and again prior to seeding
Variety	Merredin	Merredin
Planted	23rd and 24th May	Last week in May
Rate of Seed ...	45	50
Graded	Yes	Recleaned
Treated	Yes (dry)	Yes (dry)
Rate of Super. ...	60	90
Disease	Trace of Ball and Flag Smut and Takeall	Very slight trace Smut

MERREDIN AGRICULTURAL SOCIETY.

With the exception of one competitor, who was unable to delay his harvesting until the crop could be inspected, all the entrants submitted their crops for inspection. This indicates the seriousness with which they regard the competition.

The awards made are set out in the table hereunder:—

MERREDIN CROP COMPETITION: TEASDALE CUP.

Name and Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth 10 points.	Total, 100 points.
Teasdale, H. W.—Nabawa	25	17	13	13	8	76
Harling, Bros.—Nabawa	22	18	14	12	7	73
Miller, O. C.—Dollar	24	16	12	13	7	72
Pollock, R.—Merredin	23	15	11	12	9	70
Teasdale Bros.—Nabawa	22	16	12	12	8	70
Rowan, C. H.—Nabawa	26	14	11	12	7	70
Hughes, Jas.—Newman's Early	24	16	12	11	7	70
Robartson Bros.—Newman's Early ...	24	15	11	11	7	68
Kinnett, J. E.—Nabawa	21	15	12	12	7	67

The winning crop in this competition was portion of 180 acres of "Nabawa," which was fairly free from admixture. It was of uniform height, and had stooled evenly, but its appearance was marred by a sprinkling of wild oats and mustard. A very slight trace of Smut and Take-all was present.

The second prize crop was part of 120 acres of "Nabawa," and being on new land was practically free from weeds. It was almost free from admixture except for a little barley. A little Septoria was present, and as is general with new land the crop was not even in height, nor had it stooled evenly.

The interest and friendly, but keen rivalry, which exists amongst the competitors in this district competition was very noticeable. This is only as it should be, and is for the benefit of all concerned.

The rainfall, as officially recorded at Merredin, was:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total. May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
...	27	224	61	109	190	293	91	101	95	879	38	5	1,234

The methods of cultivation adopted by the competitors are set out in the table hereunder:—

MERREDIN DISTRICT CROP COMPETITION.

(Zone 5.)

Competitor ...	Jas. Hughes.	H. W. Teasdale.	O. C. Miller.	Harling Bros.	R. Pollock.
Years Cropped	First	Fifth	Third	First	Third
Timber ...	Salmon and Gimlet	Mostly Gimlet, Scrub on one corner	Salmon, Gimlet, and Morrell	White Gum, Jam, Gimlet	Salmon and Gimlet
Ploughed ...	June	July and Aug.	August	Cultivated twice, July and Sept.	Late in June
Make of Plough	Disc	Disc	Disc	Disc cultivator	Mouldboard
Depth ...	4 inches	3½ inches	3 inches	2½ inches	4½ inches
Condition of land at time of ploughing	Good	Good	Patches hard	Good	Good
Other Cultivations	Cultivated with Disc in Aug. and in Sept. Springtyned in Nov., and before planting	Springtyned in Sept. Planted with Combine	Cultivated ahead of drill	Cultivated prior to seeding	Sundered in late Sept. After rain in Jan., and again before drilling
Variety ...	Newman's Early	Nabawa	Dollar	Nabawa	Merredin
Planted ...	Third week in May	First week in May	Third week in April	Second week in May	Second week in May
Rate of Seed ...	50	45	33	45	45
Graded ...	Yes	Yes	Recleaned	Yes	Recleaned
Treated ...	Yes (Dry)	No	Yes (Dry)	Yes (Dry)	Yes (Dry)
Rate of Stand	100	75	80	90	90
Disease ...	Trace Smut, and a very slight trace rust	Very slight trace Smut, Takeall in small patches	Trace Smut, Dummy heads apparently frost	Trace Septoria	Trace Ball Smut, Flag Smut plentiful

MERREDIN DISTRICT CROP COMPETITION -*continued.*

(Zone 5.)

Competitor ...	Teasdale Bros.	A. C. Rowan.	J. E. Kinnett.	Robartson Bros.
Years Cropped	Third	Fifth	Third	Third
Timber ...	Salmon, Gimlet and a little Morrell	Salmon and Gimlet	Mallee, Morrell and Gimlet	Salmon, Gimlet and Mallee
Ploughed ...	July	July	June	July
Make of Plough	Mouldboard	Disc	Mouldboard	Sundercut
Depth ...	4 inches	3½ inches	4 inches	4 inches
Condition of land at time of planting	Good	Good	Good	Good
Other Cultivations	Sundercut in Aug., Springtyned in Sep., early and late March. Planted with Combine	Disced in Aug. and in Sept., Duckfoot scarified in March after rain with harrows attached	Springtyned in August. Skim disced in Sept. Springtyned in Oct., and in April	Springtyned Sept. and Oct. Skimmed with Sundercut ahead of drill
Variety ...	Nabawa	Nabawa	Nabawa	Newman's Early
Planted ...	First week in May	Second week in May	First week in May	Last week in May
Rate of Seed ...	45	45	36	60
Graded ...	Yes	Yes	Yes	Re-cleaned
Treated ...	No	No	Yes (Dry)	Yes
Rate of Super.	80	130	90	80
Disease ...	Takeall, slight	Several patches Takeall. Trace of Smut	Trace of Smut, and a little Takeall	Trace Bunt Flag Smut and Takeall

BRUCE ROCK AGRICULTURAL SOCIETY.

This society, in addition to a crop competition (The "Mann" Cup), also conducts a crop and fallow competition. For the former 29 entries were received, and for the latter there were 10 competitors in the fallow section of the competition; of these five withdrew before the crop was inspected. Of the 29 entries for the "Mann" Cup 12 withdrew, some of whom notified the secretary prior to the visit of the judge, but others did not do so until his arrival on the farm. This latter practice should be avoided as it wastes the time of the judge, when such time can badly be spared, because of the expedition necessary in connection with the judging of these competition crops.

Fallow and Crop Competition.

The awards made for the fallow and crop competition are set out in the table hereunder:—

BRUCE ROCK CROP AND FALLOW COMPETITION.

Name and Variety.	Estimated Yield 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth 10 points.	Total, 100 points.
Brown, A. W. J.—Nabawa	27	19	14	12	8	80
Brown, S. A.—Nabawa	25	17	12	12	7	73
McCarthy, P. and Son—Nabawa	23	16	12	13	7	71
Higgs, Jas.—Nabawa	23	12	11	12	6	64
Taylor, F. J. D.—Nabawa	21	14	8	11	7	61

In the fallow competition, the points awarded were:—Brown, A. W. J., 95; Brown, S.A. 92; McCarthy, P., and Son, 95; Higgs, J., 63; Taylor, F. J. D., 78.

The judging of the fallow section was carried out by Mr. H. Rudall, Field Officer, who has previously made the awards and comments.

The winning area of the crop section of this competition was 50 acres of "Nabawa," which was part of 110 acres of the same variety. It was free from weeds, being one of the cleanest crops in this respect which was inspected in the whole zone.

The second prize crop was also of the variety "Nabawa," and was part of 180 acres. The rainfall, as officially recorded at Bruce Rock, was:—

Jan.	Feb.	Mar.	April.	Growing Period. May.	June.	July.	Aug.	Sept.	Oct.	Total, May to Oct.	Nov.	Dec.	Total.
...	28	208	127	115	192	430	124	142	120	1,123	31	12	1,529

The methods of cultivation adopted by the competitors are set out in the table hereunder:—

BRUCE ROCK DISTRICT.

CROP AND FALLOW COMPETITION. (Zone 5.)

Competitor ...	Jas. Higgs.	F. J. D. Taylor.	S. Brown.	McCarthy & Son.	A. W. J. Brown
Years Cropped	Third	Seventh	Fifth	Unknown	Second
Timber ...	Salmon and Gimlet	Jam, Salmon, Gimlet, Mallee	Salmon, Gimlet	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	July	July	July	June	July and August
Make of Plough	Mouldboard	Mouldboard	Mouldboard	...	Disc
Depth ...	4 inches	3½ inches	4 inches	...	4 inches

BRUCE ROCK DISTRICT CROP COMPETITION—*continued.*

(Zone 5.)

Competitor ...	Jas. Higgs.	F. J. D. Taylor.	S. Brown.	McCarthy & Son.	A. W. J. Brown
Condition of land at time of ploughing	Good	Good	Good	Good	Good
Other Cultivations	Cultivated in Sept. Disced in April. Planted with Combine	Sundercut in Aug. Springtyned in Sept. Twin disced in late Jan., and in March, after rain	Sundercut in Aug. Springtyned with harrows in Oct., Feb., and April and prior to seeding	Scarified in Aug. Springtyned in Sept. Scarified in Oct., and again springtyned after rain in March	Sundercut at end of Aug., Cultivated in Sept. Twin disced in March after rain
Variety ...	Nabawa	Nabawa	Nabawa	Nabawa	Nabawa
Planted ...	First week in May	First week in May	Second week in May	First week in May	Last week in April
Rate of Seed ...	45	45	60	45	55
Graded ...	Yes	No	Yes	Yes	Re-cleaned
Treated ...	No	No	Yes (Dry)	Yes (Dry)	Yes (Dry)
Rate of Super.	80	90	140	90	90
Disease ...	Smut	Smutted badly, and little Takeall	Takeall patches and Ball Smut scattered throughout.	Takeall in several patches	...

THE "MANN" CUP COMPETITION.

The awards made in connection with the "Mann" Cup crop competition are set out in the table hereunder:—

BRUCE ROCK CROP COMPETITION: MANN CUP.

Name and Variety	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth 10 points.	Total, 100 points.
Brown, A. W. J.—Nabawa	27	19	14	12	8	80
Liebick, E.—Merredin	27	19	12	13	8	79
Smith, C. and A. H.—Gluclub	26	18	14	12	8	78
Strange, P. A.—Nabawa	28	17	13	12	8	78
Smith, C. and Sons—Major	23	19	13	13	7	75
Pascoe, E.—Nabawa	24	17	13	13	7	74
Strachen, W. —Club Head	26	15	12	11	9	73
Wheeler, A. W.—Nabawa	26	15	12	12	7	72
Ashbury, A. E.—Sailor's Fortune	24	16	13	11	7	71
Faulkiner, D. H.—Nabawa	24	16	11	12	8	71
Johnson, W. D.—Nabawa	21	16	13	12	8	71
Mann, R.—Nabawa	23	16	12	11	8	70
Vann, W.—Nabawa	21	18	11	13	7	70
Stewart, Mrs. J.—Gluyas Early	22	16	11	11	7	67
Cuthbert, L. C.—Nabawa	24	13	11	12	6	66
Negri, D.—Nabawa	23	14	11	11	6	65
Pinker, J.—Nabawa	20	15	10	12	7	64

The winner of the first prize also won the first prize in the fallow and crop competition with the same crop, and this has already been commented upon.

The second prize crop was 50 acres of "Merredin." This was also particularly free from weeds, and very even in height; it had also stooled well, although it was inclined to lodge in patches.

The methods of cultivation adopted by the competitiors are set out in the table hereunder:—

BRUCE ROCK DISTRICT CROP COMPETITION. (Zone 5.)

Competitor.	W. D. Johnson.	E. Pascoe.	C. & A. H. Smith.	L. C. Cuthbert.
Years Cropped	Five years	Second	First	Sixth
Timber ...	Half Salmon, Mallee and Jam rest scrub plain	Salmon and Gimlet	Salmon and Gimlet	Salmon, Gimlet and some Jam
Ploughed ...	August	July and August	August	July
Make of Plough	Mouldboard	Disc	Mouldboard	Disc
Depth	4in.	4in.	3in.	4in.
Condition of land at time of ploughing	Fairly good	Good	Good	Good
Other Cultivations	Springtyned twice in September; in March after rain and before seeding	Planted with Combine	Cultivated in September; Springtyned again in March	Sundercut in September and prior to seeding
Variety ...	Nabawa	Nabawa	Gluclub	Nabawa
Planted ...	24th to 27th April	Third week in April	Second week in May	24th April to 8th May
Rate of Seed	45	45	40	45
Graded ...	Yes	No	Recleaned	Yes
Treated ...	No	Yes (dry)	Yes (dry)	No
Rate of Super.	100	90	80	90
Disease ...	Very slightly smutted and a little Takeall	Traces Takeall and Septoria on stem	...	Takeall and Smut

BRUCE ROCK DISTRICT CROP COMPETITION. (Zone 5.)

Competitor.	J. Stewart.	E. Liebick.	Robt. Mann.	W. Vann.
Years Cropped	Fourth	Fourth	Fourth	Second
Timber ...	Salmon and Morrell	Salmon and Gimlet	Morrell, Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	July	July and August	July and August	July and August
Make of Plough	Disc	Mouldboard	Mouldboard	Mouldboard
Depth	5in.	3in. to 4in.	4in.	4in.
Condition of land at time of ploughing	Good	Good	Good	Good.
Other Cultivations	Sundercut in September. Springtyned prior to seeding	Sundercut in September and October. Springtyned prior to seeding	Springtyned in September and April. Sundercut prior to seeding	Springtyned in October, March and prior to seeding
Variety ...	Gluyas Early	Merredin	Nabawa	Nabawa
Planted ...	Middle June	Third week in May	Second week in May	First week in April
Rate of Seed	60	60	55	70
Graded ...	No	Yes	No	Recleaned
Treated ...	Yes (dry)	Yes	Yes (dry)	Yes (dry)
Rate of Super.	100	70	90	100
Disease ...	Ball smut, Flag smut, and Takeall slightly	Ball smut slight	Takeall in small patches. Trace of smut	Ball smut, Takeall, and Septoria

BRUCE ROCK DISTRICT CROP COMPETITION—*continued.*

(Zone 5.)

Competitor.	W. Strachen.	C. Smith & Sons.	P. A. Strange.	J. Pinker.
Years Cropped	Fifth	Third	Fifth	Third
Timber ...	Salmon & Gimlet...	Sandplain to forest	Morrell, Gimlet and Salmon	Salmon and Gimlet
Ploughed ...	July and August ...	July and August ...	July	August
Make of Plough	Sundercut	Disc	Disc	Disc
Depth	3in. to 4in.	3½in.	4in.	2in.
Condition of land at time of ploughing	Good	Sticky in patches	Good	Hard
Other Cultivations	Cross-disced with Sundercut. Cultivated prior to seeding	Springtyned in October ; Sundercutted and drilled	Sundercut in September. Springtyned in October. Cultivated before seeding	Cultivated in early April and prior to seeding
Variety ...	Clubhead	Major	Nabawa	Nabawa
Planted ...	Middle April	Middle April	First week in May	Second week in May
Rate of Seed	60	45	50	60
Graded ...	No	Yes	Recleaned	Yes
Treated ...	Yes (wet)	Dry	Yes (dry)	Yes (wet)
Rate of Super.	90	90	96	80
Disease ...	Takeall and trace of Septoria	Trace of Takeall	Trace of Takeall.	Takeall

BRUCE ROCK DISTRICT CROP COMPETITION—*continued.*

(Zone 5.)

Competitor.	A. W. Wheeler.	A. E. Ashbury.	D. H. Faulkner.	A. Brown.
Years Cropped	Fourth	Second	Third	Second
Timber ...	Salmon, Gimlet and a little White Gum	Jam, Gimlet, Mallee	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	July and August	August	July	July and August
Make of Plough	Disc	Mouldboard	Mouldboard	Disc
Depth	4in.	4in.	4in.	4in.
Condition of land at time of ploughing	Hard at finish	Getting hard	Parts hard ; mostly good	Good
Other Cultivations	Springtyned in September, after rain in March, and prior to seeding	Sundercutted prior to seeding	Sundercut in August ; springtyned in March	Sundercutted in August. Cultivated in September. Twin-disced in March after rain
Variety ...	Nabawa	Sailor's Fortune	Nabawa	Nabawa
Planted ...	Third week in April	Third week in April	First week in May	Last week in April
Rate of Seed...	50	50	60	55
Graded ...	Recleaned	Yes	Recleaned	Recleaned
Treated ...	Yes (dry)	Yes (dry)	No	Yes (dry)
Rate of Super.	70	90	70	90
Disease ...	Takeall in patches	Trace of Takeall	Ball Smut and trace of Takeall	...

BRUCE ROCK DISTRICT CROP COMPETITION—*continued.*
(Zone 5.)

Competitor.	D. Negri.
Years Cropped	Eighth
Timber	Salmon and Gimlet
Ploughed	July and August
Make of Plough	Mouldboard
Depth	4in. to 5in.
Condition of land at time of ploughing	Good with hard parts
Other Cultivations	Springtyned in August and March and prior to seeding
Variety	Nabawa
Planted	Middle of May
Rate of Seed	45
Graded	Yes
Treated	No
Rate of Super	90
Disease	Takeall in patches and scattered Ball and Flag Smut

THE ROYAL AGRICULTURAL SOCIETY.

Owing to the Kellerberrin Agricultural Society not providing for a district competition, Mr. J. Deane Hammond, of this district, entered directly with the Royal Agricultural Society. The details of the award made are set out hereunder:—

ROYAL AGRICULTURAL SOCIETY. (Zone 5.)

Name.	Address.	Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
Hammond, J. D.	Kellerberrin	Nabawa ...	30	15	13	13	7	78

The rainfall, as recorded at Kellerberrin, was:—

Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Total.
				May.	June.	July.	Aug.	Sept.	Oct.				
2	24	259	143	105	208	408	168	131	119	1,139	35	No record	

The methods of cultivation, as adopted by Mr. Hammond, are set out in the table hereunder:—

ROYAL CROP COMPETITION. (Zone 5.)

Competitor.	J. Deane Hammond.
Years Cropped	For 20 years
Timber	Gimlet
Ploughed	September
Make of Plough	—
Depth	—
Condition of land at time of ploughing	Good
Other Cultivations	Cultivated with Springtyne in March after rain. Disced with Sundercut end of April. Sown with Combine. Harrowed after seeding
Variety	Nabawa
Planted	Middle of May
Rate of Seed	60
Graded	Yes
Treated	Dry
Rate of Super.	112
Disease	Takeall patches

ZONE 6.

Mr. T. Richards, of South Caroling, was the only competitor in this zone. As no provision was made by any of the district societies in the zone, he entered direct with the Royal Agricultural Society. The details of the award made are as hereunder:—

ROYAL AGRICULTURAL SOCIETY. (Zone 6.)

Name.	Address.	Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total. 100 points.
Richards, T. ...	South Caroling	Nabawa ...	29	17	13	13	8	80

This exhibit was a crop of 50 acres of "Nabawa," which was well grown, even in height, and had stooled regularly. These conditions indicated that the various operations in connection with the cultivation and cropping had been carried out well.

The rainfall officially recorded at South Caroling was:—

Jan.	Feb.	Mar.	April.	Growing Period. May.	June.	July.	Aug.	Sept.	Oct.	Total. May to Oct.	Nov.	Dec.	Total.
...	138	147	129	99	198	586	104	151	178	1,259	77	6	1,813

The method of cultivation adopted by the competitor was as under:—

ROYAL CROP COMPETITION. (Zone 6.)

Competitor.	T. Richards.
Years Cropped	Fourth
Timber	Salmon, Gimlet and Morrell
Ploughed	July
Make of Plough	Mouldboard
Depth	4½in. to 5in.
Condition of land at time of ploughing	Good
Other Cultivations	Springtyned during September. During summer after rain
Variety	Nabawa
Planted	Second week in May
Rate of Seed	40
Graded	Yes
Treated	Dry
Rate of Super.	112
Disease	Takeall; Septoria on stems

CHAMPIONSHIP CROP COMPETITIONS, ROYAL AGRICULTURAL SOCIETY.

With the object of stimulating interest in the District Crop Competitions, which were initiated by the Royal Agricultural Society in 1921, the Society, with the assistance of the Minister for Agriculture (Hon. M. F. Troy) has donated a champion prize of £10, and a reserve champion prize of £2 10s. for the best two crops in each Zone—of which there are eight—into which the Wheat Belt is divided.

The entrants for these championship prizes are the first and second prize winners of the district competitions, and also the competitors who enter direct with the Royal Agricultural Society.

The competitors in the different zones and the total points alloted are shown in the table hereunder:—

REPRESENTATIVES FROM DISTRICT CROP COMPETITIONS.

Zone, Name, and Society.	Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
1—Cuming Bros., Royal... ...	Yan. King ...	38	17	13	13	9	90
Bothe, D. B., Royal ...	Nabawa ...	30	19	13	14	8	84
2—Harris, A. T. & Sons, Dalwallinu	Gresley ...	27	19	14	12	9	81
Bradford Bros., Dalwallinu ...	Gluyas E. ...	27	17	14	13	8	79
3—Ackland, H. B., Wongan Hills	Nabawa ...	32	18	14	14	8	86
Booth, W. J., Wongan Hills...	Nabawa ...	33	17	14	13	8	85
O'Loughlin, M. J., Dowerin ...	Sailor's For.	28	18	14	14	8	82
*Bear, H. E., Dowerin ...	Nabawa ...	27	18	12	14	8	79
*Hughes, J. H., Dowerin ...	Sailor's For.	26	18	14	14	7	79
4—Young, G. P., Nungarin ...	Nabawa ...	28	18	14	14	8	82
Williams, F. A., Nungarin ...	Nabawa ...	28	17	14	14	8	81
Webster & Pratt, Mt. Marshall	Nabawa ...	25	18	14	13	8	78
Hopwood, B. W. G., Mt. Marshall	Gluyas E. ...	24	18	12	13	8	75

*A tie.

REPRESENTATIVES FROM DISTRICT CROP COMPETITIONS—*continued.*

Zone, Name, and Society.	Variety.	Estimated Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth. 10 points.	Total, 100 points.
5—Cooke, H. F., Tammin ...	Nabawa ...	29	18	13	13	8	81
Brown, A. W. J., Bruce Rock	Nabawa ...	27	19	14	12	8	80
Barton, R. & Sons, Doodlakine and Baandee	Gluyas Late	27	18	14	12	8	79
Liebick, E., Bruce Rock ...	Merredin ...	27	19	12	13	8	79
Hammond, J. D., Royal ...	Nabawa ...	30	15	13	13	7	78
Uphill, G., Tammin	Gluyas E. ...	25	18	12	14	9	78
Barnes, F., Doodlakine and Baandee	Gluyas E. ...	27	18	10	13	9	77
Teasdale, H. W., Merredin ...	Nabawa ...	25	17	13	13	8	76
Harling, Bros., Merredin ...	Nabawa ...	22	18	14	12	7	73
6—Richards, T., Royal	Nabawa ...	29	17	13	13	8	80
7—Bowey, P. J., Kulin ...	Queen Fan ...	25	18	12	12	8	75
Gray, J. S., Kulin	Queen Fan ...	25	17	12	13	7	74
8—Parkinson, A. W., Gnowangerup	Yan. King ...	37	18	13	13	7	88
McDonald, J., Gnowangerup	Nabawa ...	33	17	13	12	7	82
Elliott, Bros. Royal	Lotts ...	30	17	13	12	7	79
Clifford, M., Royal	Federation ...	15	17	13	12	7	64

The awards therefore, will be:—

AWARDS.—ROYAL SOCIETY ZONE AWARDS.

From these entrants the awards in each Zone have been made, and are as follows:—

Zone, Name, and Address.	Society and Variety.	Total Points.	Place.
1—Cuming, Bros., Carnamah	Royal—Yandilla King...	90	1st
Bothe, D. B., Coorow	Royal—Nabawa	84	2nd
2—Harris, A. T., and Sons, Dalwallinu	Dalwallinu—Gresley	81	1st
Bradford Bros., Damboring	Dalwallinu—Gluyas E.	79	2nd
3—Ackland, R. B., Wongan Hills	Wongan Hills—Nabawa	86	1st
Booth, W. J., Wongan Hills	Wongan Hills—Nabawa	85	2nd
4—Young, G. F., Talgomine	Nungarin—Nabawa	82	1st
Williams, F. A., Nungarin	Nungarin—Nabawa	81	2nd
5—Cooke, H. F., Tammin	Tammin—Nabawa	81	1st
Brown, A. W. J., Ardath	Bruce Rock—Nabawa	80	2nd
6—Richards, T., South Caroling	Royal—Nabawa	80	1st
7—Bowey, P. J., Kulin	Kulin—Queen Fan	75	1st
Gray, J. S., Kulin	Kulin—Queen Fan	74	2nd
8—Parkinson, A. W., Gnowangerup	Gnowangerup—Yandilla King ...	88	1st
McDonald, J., Gnowangerup	Gnowangerup—Nabawa	82	2nd

In addition to the above awards a special prize of five guineas is donated by the Royal Agricultural Society for the fifty acres giving the highest yield in any zone. This award was won by Messrs. Cuming Bros. of Carnamah, whose crop was calculated to yield 38 bushels per acre. They were very closely followed by Mr. A. W. Parkinson, of Gnowangerup, with a crop calculated to yield 37 bushels per acre. The competitors whose yields were 30 bushels or more were:—

LEADING COMPETITORS FOR ROYAL SOCIETY'S SPECIAL PRIZE FOR HIGHEST YIELD IN ANY ZONE.

Zone, Name, and Address.	Variety.	Estimated Yield. Bushels.
1.—Cuming Bros., Carnamah	Yandilla King	38
8—Parkinson, A. W., Gnowangerup	Yandilla King	37
8—McDonald, J., Gnowangerup	Nabawa	33
3—Booth, W. J., Wongan Hills	Nabawa	33
3—Ackland, R. B., Wongan Hills	Nabawa	32
1—Bothe, D. B., Coorow	Nabawa	30
5—Hammond, J. D., Kellerberrin	Nabawa	30
8—Elliott Bros., Gillimanning	Lotts	30
8—Allardyce, A. H., Gnowangerup	Nabawa	30

VICTORIA DISTRICT AGRICULTURAL SOCIETY CROP COMPETITION.

Judge: F. L. SHIER, B.Sc.(Agric.), Agricultural Adviser.

The method adopted for judging the Royal and District Agricultural Societies' competition was also adopted in this competition, but owing to the scale of points somewhat differing this society was unable to be represented in the championship prize in this (No. 1) zone.

The results of the competition judged, according to the following scale of points, are herewith:—

	Points		Penalties.	Points.
Yield	... 35			
Freedom from weeds ...	... 25	1st Crop	...	6
Freedom from Disease ...	... 15	2nd Crop	...	4
Freedom from Admixture	... 15	3rd Crop	...	2
Evenness of Growth ...	... 10			
Total ...	... 100			

VICTORIA DISTRICT CROP COMPETITION.

Name.	Variety.	Estimated Yield. 35 points.	Freedom from Weeds. 25 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth. 10 points.	Total 100 points.
Forrester Bros.	Marshall's No. 3	29	22	13	12	8	84
Meadowcroft Bros.—No. 1 ...	Nabawa ...	27	21	14	13	7	82
Oldham, R.—No. 1 (1)	Nabawa ...	28	19	14	13	8	82
Mann, H. R. (2)	Nabawa ...	27	20	13	13	8	81
Clinch, A.	Nabawa ...	26	20	14	13	7	80
Oldham, R. No. 2 (3)	Merredin ...	25	19	13	12	8	77
Meadowcroft Bros.—No. 2 (4) ...	Toby's Tusk	26	19	12	11	8	76
Cream, J. S. (5)	Nabawa ...	23	16	10	12	7	68

Penalties.—(1) 6 points new land.
(2) 4 points, second crop.
(3) 6 points new land.
(4) 3 points portion new land, portion third crop.
(5) 6 points new land.

The winning crop, that of Messrs. Forrester Bros., "Wicker," *via* Northern Gully, of the variety "Marshall's No. 3" was calculated to yield 29 bushels to the acre. It was very thick, having stooled well and had densely filled ears. It contained a few wild oats and mustard, some strangers, and was affected with rust.

Messrs. Meadowcroft Bros.' crop of "Nabawa," which was judged to yield 27 bushels, was a thick, even cop, with well filled heads. Mustard and silver grass were present, but the crop was very free from disease and strangers.

Five of the other entrants were unfortunate in being penalised for the newness of their land.

The details of cultivation, as adopted by the various competitors, is set out hereunder for comparison:—

VICTORIA DISTRICT CROP COMPETITION.

Competitor ...	A. Clinch.	T. S. Cream.	Meadowcroft. Bros. (No. 2).	R. Oldham (No.) 2).
Years Cropped	Since 1860	First	Half first crop, half third crop	First
Timber ...	Wattle scrub	Jam and York	Salmon and York	York
Ploughed ...	July	—	August	July, 1925
Make of Plough	Set Mouldboard	—	Disc	Disc
Depth ...	4 to 5 inches	...	4 inches	3 to 4 inches
Condition of land at time of ploughing	Good	...	Good	Good
Other Cultivations	Cultivated Oct. and March. Harrowed May and before drill	Sown with Sunder Seeder	Once Springtooth	Disc cultivated. Once Combine drill
Variety ...	Nabawa	Nabawa	Toby's Tusk	Merredin
Planted ...	June 1st	End of May	First week May	Middle of May
Rate of Seed ...	60	60	60	55
Graded ...	Yes	Yes	Yes	Yes
Treated ...	Wet	Dry	Wet	...
Rate of Super.	60	75	60	112
Disease ...	...	Ball Smut	Ball Smut trace	Trace loose Smut

VICTORIA DISTRICT CROP COMPETITION—*continued.*

Competitor ...	R. Oldham.	H. R. Mann.	Forrester Bros.	Meadowcroft Bros (No. 1).
Years Cropped	First	Second	Eighth	Fifth
Timber ...	York and Jam	York Gum	York	York and Jam
Ploughed ...	July, 1925	July, 1925	Early August, 1925	June. 1925
Make of Plough	Disc	Sundercut	Disc	Mouldboard
Depth ...	3 to 4 inches	4½ inches	3 inches	4 inches
Condition of land at time of ploughing	Good	Good	Good	Good
Other Cultivations	Disced once in October	Springtyned after plough and prior to seeding	Springtyned before seeding	Springtyned December and before seeding
Variety ...	Nabawa	Nabawa	Marshall's No 3	Nabawa
Planted ...	Second week in May	First week in May	First week in May	End of April
Rate ...	55	60	60	60
Graded ...	Yes	...	Yes	Yes
Treated ...	...	...	Dry	Wet
Rate of Super.	112	90	50	65
Disease ...	...	Trace Septoria	Rust (Flag)	

"JUNIOR" FIELD VARIETY TRIALS WITH WHEAT AND OATS AT THE MERREDIN EXPERIMENT FARM, 1926.

E. J. LIMBOURN.

Merredin Experiment Farm.

These trials were commenced in 1924, and were initiated mainly for the purpose of obtaining sufficient grain, grown under field conditions, for milling tests of such varieties of wheat of which only small quantities of seed were available. Previously the grain for such tests had been grown in the test rows, and experience had shown that, under the conditions which obtained, the results were unsatisfactory for comparison.

In these trials each variety is planted with the farm seed drill—15 runs or tubes wide—but instead of, as in ordinary farm practice, each variety being sown through all the tubes or runs of the drill, it is sown through two of them only, and because of the small area planted and the consequent difference in area between this trial and the usual Field Trials, this one has been called the "Junior" Trial.

The fertiliser applied and the rate of seeding were the same as those used for the main crops, and were 96 lbs. superphosphate (22 per cent.) and 45 lbs. of seed per acre.

Each drill width is occupied by five varieties, with two rows of the well-known variety "Gluyas Early" planted on each side, to act as control plots, and with which comparisons can be made. Each plot, as with the main Field Variety Trial, is 10 chains long.

Shortly after the germination of the seed this experiment plot was divided into 10 sections, each 87 links long, and two shorter buffer sections, one at each end. Between each section there is a division 3 links wide, which was used as a pathway to facilitate observations being made during the course of the trial.

With the object of securing an indication of the ability of the varieties under trial to produce hay and grain, three of the short sections were reaped at the hay stage, and five of them harvested and thrashed for grain. The results in each case were compared with the outside control plots of "Gluyas Early." As the plots harvested are so small—1/640th of an acre—the results obtained cannot be accepted as reliable comparisons of the prolificacy of these varieties, but are useful, when the other characteristics are satisfactory, to indicate the desirability of including them in the usual Field Variety Trial.

The other two sections were allowed to remain in the field long after maturity in order to determine the strength of their straw, and their tendency to "shed."

In addition to the control variety—"Gluyas Early"—thirty varieties were included in this trial. They were planted on 7th May, and at this time the ground was in good tilth, but dry. Light rains fell about the middle of the month, causing a fair proportion of the grain to malt. Germination was rather slow and patchy, the majority of plants not showing up until 29th May.

Growth at first was rather slow, but with good rains and rather mild weather from mid June until August, growth became more rapid, and inclined to become rank. August rainfalls were light, the first three weeks being exceptionally dry. Temperatures were also rather low with frosts almost every night.

The soil was of rather a loose nature and quickly dried out, thus forcing the earlier maturing varieties into ear somewhat prematurely, and generally checking the growth of all varieties.

Early in September two very severe frosts nipped the varieties that were in the flowering stage, the greatest damage being done to "M.D. 18," the first growth of which was quite destroyed.

With other varieties only a few early ears were affected, and the damage done was not sufficient to affect grain yields materially. Septoria set in after the frost, "M.D. 18" being badly attacked; all early growth had the disease on nodes, straw and ears. Other varieties had only the spotting of the leaf blade.

The whole experiment now showed signs of a severe check. Having made rather rank growth, with abnormal stooling and flag growth, the sudden check caused the ears to be pinched, and the grain rather shrivelled.

Early September was very dry, causing the sheath and auricle to become dry and harsh, so that the majority of ears were not only pinched at the tip, but also became malformed when leaving the sheath. This applied especially to varieties like "Gluyas Early," which has a fairly long tip awn. The awn became caught by the auricle forcing the ear to leave the sheath from the side, some ears becoming bent quite double. Moderate falls of rain during August and towards the end of September gave the late varieties some advantage over the early ones. They had, however, stooled out so well that the rainfall was insufficient, and what ears did form hardly got clear of the sheath, and certainly did not mature normally.

There were a few small patches of "Takeall, but not sufficient to affect results.

Pink grains, due to Septoria, were found in all varieties except "Gluyas Early," "Queen Fan," "Barwang," "Bald Early," "M.D. 3," "M.D. 17," "M.D. 19," "C. 47," "C. 49," "Wilfred," "Niloe," "Waratah," "Rajah," and "Clarendon."

The observations made during these tests on the characteristics of the different varieties are as follow:—

Bald Early, P984.—A good hay variety, but usually only of moderate height under our conditions, and of promise as a dual purpose variety.

Type—White bald ear rather open and inclined to shed the grain, a little purple straw, of good standing quality.

Disease.—Susceptible to Bunt and Flag smut, and showed slight traces of rust in the rows this season.

Maturity.—Midseason.

Barwang (*Cowra* 30), P1536.—Evidently a hay variety that requires a better rainfall. Although it showed great promise in the Test Rows the results in the Field Trial indicate it to be unsuitable.

Type.—White tapering ear with tip awn, non-shedding Slender yellow straw, good hay type, and stands well.

Disease.—Very susceptible to Bunt and Flag Smut. Slight traces of rust found in Test Rows this season.

Maturity.—Midseason.

Bena, P1614.—Received from Cowra, N.S.W. in 1924 and planted that year in the Test Rows. It did not show any great promise, for although a rather good stooler the ears were badly "tipped." On account of remarkable yields published, it was included in Junior Field Trial, 1925, and again 1926. From the results of these tests this variety does not appear suitable for districts of similar rainfall to this, and it cannot stand a sudden dry spell during growth. Being a selection from Federation it has the fault of that variety, in that the apical leaf blade, and in some cases the whole sheath, is apt to curl up during a dry spell, causing the young ear in the sheath to become pinched and so causing the upper portion of the ear to wither.

It stools out well and should yield well under suitable conditions, but, when compared with varieties of similar maturity, there is nothing to indicate that it has special merit. Several types with short straw look equally as promising for conditions suitable to such varieties.

Type.—Brown tapering ear, with tip awn, rather open and of a very showy appearance. Non-shedding. Hollow straw, stands fairly well, but does not seem very suitable for hay, being of only medium height.

Disease.—Very susceptible to Bunt and Flag Smut, and was rather bad with Rust in the rows, both red and black spores forming.

Maturity.—Midseason, rather later than Nabawa.

Caliph, P914.—A promising variety for both grain and hay. Has proved itself rather better than "Sultan," P1199, a very similar type.

Type.—White tapering ear with tip awns, slender yellow straw of good weight and fair quality of hay. Stands well and does not shed grain.

Disease.—Susceptible to Bunt. No Flag Smut in Resistance Test but one plant found with disease in Test Rows. Traces of Rust also found in Test Row plantings.

Maturity.—Midseason.

C46 (*Minister* x *Tobys Tusk*), *Type III.*—A Chapman crossbred of rather promising appearance. Results are rather disappointing, however, and it apparently requires a better rainfall

Type.—White tapering ear, with tip awn. Does not shed.

Disease.—Moderately susceptible to both Bunt and Flag Smut. No trace of Rust.

Maturity.—Early.

C 47 (*Minister* x *Tobys Tusk*), *Type II.*—A midseason hay type that failed to yield in accordance with appearance in Test Rows. Evidently not suited to local conditions.

Type.—White tapering with slight awn. Does not shed. Slender yellow straw of a good hay quality.

Disease.—Very susceptible to both Bunt and Flag Smut. Traces of rust found in Test Row planting.

Maturity.—Midseason, slightly earlier than Nabawa.

C 48 (*Fortune* x *Gluyas Early*), *Type I.*—A very promising type, but requires a better rainfall. Badly tipped by dry spell in September.

Type.—Brown, tapering ear with tip awn. Spikelets very spreading and shows a possibility of developing 5 or 6 grains under suitable conditions. Stout straw, not very suitable for hay.

Disease.—Susceptible to both Bunt and Flag Smut and was rather badly attacked by Rust in Test Row plantings. Both Red and Black spores developed.

Maturity.—Midseason rather later than Nabawa.

C 49 (*Fortune* x *Gluyas Early*), *Type III.*—This has proved the best of the Chapman crossbreds under test, yielding well both for hay and grain.

Type.—White tapering ear with tip awn, rather similar in appearance to C 48 except that it is white instead of brown. It shows the same possibilities for high yield and is certainly more suited to our conditions. Rather stout straw, of fairly good quality for hay and stands well. Grain does not shed.

Disease.—Rather susceptible to Bunt and Flag Smut. Traces of Rust in Test Row plantings.

Maturity.—Midseason, about equal to Nabawa.

Clarendon, P1507.—A hay variety planted for comparison with Geeralying. Although good for hay it has not proved very promising for grain. Geeralying is easily the better of the two varieties.

Type.—White tapering ear with slight tip awn, does not shed. Slender yellow straw. Good quality hay of good heighth. Stands fairly well.

Disease.—Very susceptible to Bunt and is also liable to Flag Smut. Slight traces of Rust found in Test Row plantings.

Maturity.—Very Early.

Cuballing, P1444.—A late hay variety, but inferior to "Turvey."

Type.—Brown tapering, very open ear, bald, of a very showy appearance. Medium stout purple straw, of good hay quality. Stands well.

Disease.—Susceptible to Bunt. Traces of Rust found in Test Row plantings. Not included in Flag Smut Resistance Test, No trace of that disease yet found in Test Row plantings.

Maturity.—Late, about equal to Turvey.

Fortune, P911.—A promising variety for districts with better rainfall. Not suitable for our conditions.

Type.—White square ear with slight awn. Medium stout straw, not very suitable for hay. Stands well, non-shedding.

Disease.—Susceptible to both Bunt and Flag Smut. Traces of Rust found in Test Row plantings.

Maturity.—Late.

Geeralying, P1442. An early hay variety that also yields well for grain. Decidedly better than Clarendon.

Type.—White, tapering ear with slight tip awn. Slender straw that stands very well, although tall growing. Good quality hay.

Disease.—Susceptible to Bunt. No diseased plants found in Flag Smut Test and that disease has not yet been found in Test Row plantings. Very slight traces of Rust in Test Rows.

Maturity.—Very early.

Major, P1270.—Not suitable for local conditions; requires a much better rainfall. Stools well, but ears barely leave the sheaf and are very tip withered. Cannot stand a dry spell during growth.

Type.—White, square tip, somewhat clubbed in well matured plants. Stout straw, but makes very little growth here. Inclined to shed its grain.

Disease.—Susceptible to both Bunt and Flag Smut. Rather bad with Rust in Test Row plantings. Black spores developed.

Maturity.—Late.

M.D. 3 (*Toby's Tusk* x *Nabawa*).—A fairly good hay variety, but fails for grain

Type.—White, tapering ear with tip awn, a rather compact ear of prepossessing appearance, but inclined to shed a little. Tall growing, but stands fairly well. Straw medium stout and of rather good hay quality, but light in weight.

Disease.—Susceptible to Bunt, but resistant to Flag Smut. Slight traces of Rust in Test Row plantings.

Maturity.—Midseason, rather later than Nabawa.

M.D. 14 (*Nabawa* x *Bunyip*).—This is the most promising of the Merredin cross-breds now under test. Being early maturing with a good stout straw it should be useful for crossing with short-straw varieties of later maturity.

Type.—White, tapering, with slight awn, stout straw, that stands fairly well. Not very suitable for hay.

Disease.—Susceptible to Bunt, but resistant to Flag Smut. Slight traces of Rust in Test Row plantings.

Maturity.—Very early.

M.D. 17 (*Comeback x Jap*).—A crossbred, with Comeback grain, that shows great promise under Test Row conditions. Under Field conditions it has failed to come up to expectations and is not worth going on with.

Type.—White tapering, ear with slight tip awn, slender straw that stands well, and of fairly good hay quality.

Disease.—Susceptible to both Bunt and Flag Smut. Traces of Rust in Test Row plantings.

Maturity.—Midseason, slightly earlier than Nabawa.

M.D. 18 (*Federation* x *Bunyip*).—This variety unfortunately caught the early September frost through early planting. For a very early variety it shows great promise in the Test Rows, and has the advantage over *M.D.* 15 (*Noongaar*) in that it is resistant to Flag Smut.

Type.—Brown, tapering ear with slight awn. Medium stout straw and stands fairly well. Not very suitable for hay.

Disease.—Susceptible to Bunt but resistant to Flag Smut. Slight traces of Rust in Test Row plantings.

Maturity.—Very early, quite as early as Noongaar.

M.D. 19 (*Nabawa* x *Sunset*).—A type that showed great promise under Test Row conditions. Under Field conditions, however, it has proved a very poor yielder.

Type.—White, square tip, bald. Stout straw that stands well, indifferent for hay.

Disease.—Susceptible to Bunt, but resistant to Flag Smut. Slight traces of Rust in Test Row plantings.

Maturity.—Very early, rather later than "Noongaar."

Minister, P634.—A late variety, but requires a better rainfall and cannot stand a dry spell during late growth. Stools well but fails to mature normally under our conditions, the ears barely leaving the sheath and usually being badly tip withered.

Type.—White, tip clubbed in mature plants, with slight awn. Straw medium stout and does not make much growth under local conditions.

Disease.—Rather susceptible to Bunt and Flag Smut. Rust developed black spores in Test Row plantings.

Maturity.—Late.

Newman's Early, P955.—This variety appears to stand up to hard conditions, such as sudden dry spells; quite equal to Gluyas Early.

Type.—White, tapering ear with tip awn. Fairly good for hay. Inclined to shed a little.

Disease.—Susceptible to both Bunt and Flag Smut. Slight traces of Rust in Test Row plantings.

Maturity.—Early.

Niloc, P1277.—A variety that does not appear to be suitable for the local conditions.

Type.—White, square tipped ear, bald. Medium stout straw of indifferent quality for hay. Stands fairly well.

Disease.—Very susceptible to both Bunt and Flag Smut. Traces of Rust in Test Row plantings.

Maturity.—Midseason.

Onas, P1513.—A variety that is not suited to local conditions. Ears usually badly tipped and barely clear of sheath, Stools well but requires late rains to mature.

Type.—White, square tip with very slight awn. Stout straw of medium height, not very suitable for hay.

Disease.—Susceptible to Bunt and Flag Smut. Rust developed black spores in Test Row Planting.

Maturity.—Late.

Queen Fan, P1194.—Although a late maturing variety, it appears to be very little affected by a sudden check.

Type.—White, slightly tapering with slight awn. Medium stout straw that stands well, and is of fairly good hay quality. Does not shed. Grain rather small and of fairly good quality.

Disease.—Susceptible to Bunt but resistant to Flag Smut. Slight traces only of Rust in Test Row plantings.

Maturity.—Late, but rather earlier than Yandilla King.

Rajah, P1710.—One of the new short-strawed varieties from Victoria. It has not done very well in this season's test. It has a very showy head, but is rather inclined to shed its grain. An entirely different type to the variety of the same name (*Rajah*, P1201) from South Australia.

Type.—White, square with tip awn. Medium stout straw, short, and stands out well. Of little use for hay.

Disease.—Susceptible to Bunt and Flag Smut. Rust moderate. Black spores developed.

Maturity.—Midseason.

Roseworthy, P1190.—Unsuitable for local conditions. Stools well but requires better rainfall and late rains to mature normally. Ears very badly tipped and barely clear of sheath.

Type.—White, tapering ear with short awn. Stout straw, does not make much growth under our conditions.

Disease.—Susceptible to both Bunt and Flag Smut. Slight traces of Rust in Test Row plantings.

Maturity.—Late.

Sultan, P1199.—A variety somewhat similar to "Caliph," but not as promising.

Type.—White, tapering ear with tip awn, medium straw, fairly good quality for hay and of good height.

Disease.—Susceptible to both Bunt and Flag Smut. Slight traces of Rust in Test Row planting.

Maturity.—Midseason.

Turvey, P257.—A good hay variety for suitable conditions, but too late for this district. The ears barely leave the sheath and growth is fairly short. Requires a better rainfall to mature normally.

Type.—White, tapering, rather open ear with short awn. Slender purple straw of good hay quality.

Disease.—Susceptible to both Bunt and Flag Smut. Rust moderate. Black spores developed.

Maturity.—Late.

Viceroy, P1711.—A late, short-straw variety from Victoria, not suitable to local conditions. It made remarkable growth in the Test Rows during the dry season of 1925, but failed this season under Field Conditions. Like most late varieties it requires late rains to bring it to maturity.

Type.—Brown, tapering ear, bald. Medium to slender straw of short growth and unsuited for hay.

Disease.—Susceptible to both Bunt and Flag Smut. Rust slight, black spores developed.

Maturity.—Late.

Waratah, P1627.—Rather disease liable. It has shown great promise both in the Test Rows and the Field Trial.

Type.—Brown, tapering ear, somewhat like Gluyas Early. Slender straw of fairly good hay quality.

Disease.—Very susceptible to Bunt and Flag Smut. Slight trace of Rust only in Test Row plantings.

Maturity.—Midseason, similar to Nabawa.

Wilfred, P1037.—Has not proved a very prolific variety in the Trials; like most Federation crossbreds it cannot stand a sudden dry spell.

Type.—Brown, tapering, bald ear, medium stout straw of indifferent hay quality. Stands fairly well.

Disease.—Susceptible to Bunt. Not included in Flag Smut Test and have no record of disease being found in this variety. Slight traces of rust in Test Row plantings

Maturity.—Midseason.

The sections intended for hay were reaped by hand and weighed when cut and also after curing. The weights shown in the tables are those obtained after curing. The percentage yield given is the actual dry yield calculated as a percentage of the average yield of the two control varieties be-

tween which the other varieties were grown. The yields obtained are as follow:—

"JUNIOR" FIELD TRIAL, 1926.

HAY YIELDS.—*Weight of Sheaves after Curing in Paddock.*

Reg. No.	Variety.	Average Height when Cut.	Weight of Hay.			Average per cent. of all Sections.
			Section D.	Section F.	Section I.	
		ins.	lbs.	lbs.	lbs.	per cent.
159	Gluyas Early (Control)	36	9·25	8·50	10·25	100
834	Minister	26	6·25	6·25	8·00	74
1270	Major	28	7·75	7·00	8·25	83
911	Fortune	28	8·50	7·00	8·75	88
1190	Roseworthy ...	29	6·50	5·75	8·00	73
1513	Onas	30	8·25	7·25	8·25	86
159	Gluyas Early (Control)	33	9·00	9·25	9·00	100
159	Gluyas Early (Control)	34	8·50	8·00	8·75	100
1194	Queen Fan ...	33	9·00	8·00	8·25	95
1711	Viceroy	27	5·75	6·00	7·25	71
257	Turvey	28	8·25	7·00	8·75	89
1444	Cuballing	32	8·00	6·75	8·00	84
1536	Barwang	33	8·75	7·25	7·25	87
159	Gluyas Early (Control)	33	9·25	9·25	10·00	100
159	Gluyas Early (Control)	32	9·25	9·50	8·50	100
986	Bald Early ...	28	8·50	7·75	8·00	89
...	M.D. 3	30	8·50	8·00	9·00	93
1614	Bena	27	9·00	7·50	9·50	95
1037	Wilfred	27	8·50	8·00	8·75	92
1277	Niloc	30	7·75	7·00	8·00	83
159	Gluyas Early (Control)	35	9·25	9·00	9·25	100
159	Gluyas Early (Control)	34	8·25	6·75	8·50	100
...	M.D. 17	30	8·00	7·25	7·25	88
...	C. 47	34	7·75	6·50	7·25	84
...	C. 48	32	8·25	7·50	9·25	97
...	C. 49	34	9·00	7·50	9·00	99
1627	Waratah	34	10·00	9·00	10·00	113
159	Gluyas Early (Control)	34	9·75	8·75	9·50	100
159	Gluyas Early (Control)	33	7·75	7·50	9·50	100
1710	Rajah	30	7·75	7·00	9·00	95
1199	Sultan	33	8·00	7·75	9·25	100
914	Caliph	34	8·75	7·50	9·75	104
...	C. 46	30	7·00	5·50	7·75	81
955	Newman's Early ...	33	8·00	7·75	9·25	100
159	Gluyas Early (Control)	33	8·75	7·50	9·00	100
159	Gluyas Early (Control)	33	8·50	7·50	9·25	100
1442	Geeralying	38	9·25	8·75	10·00	109
1507	Clarendon	38	9·25	8·25	9·50	104
...	M.D. 14	35	7·50	6·75	8·50	88
...	M.D. 18	32	7·75	6·50	7·75	85
...	M.D. 19	33	7·50	7·25	7·75	88
159	Gluyas Early (Control)	34	9·25	7·75	9·50	100

GRAIN YIELDS.

Reg. No.	Variety.	Grain Yields.					Average per cent. of all Sections.
		Section A.	Section C.	Section E.	Section G.	Section J.	
		ozs.	ozs.	ozs.	ozs.	ozs.	%
159	Gluyas Early (Control)	33·125	32·250	31·125	31·250	33·000	100
834	Minister	19·125	20·875	14·625	16·875	26·750	66
1270	Major	14·750	22·250	17·625	13·500	20·750	61
911	Fortune	21·125	25·750	23·250	19·500	26·125	79
1190	Roseworthy	15·500	18·375	23·375	17·750	23·375	67
1513	Onas	17·125	19·625	20·625	18·000	25·625	77
159	Gluyas Early (Control)	26·250	30·750	23·375	24·000	28·125	100
159	Gluyas Early Control)	23·000	20·875	24·625	15·750	21·250*	100
1194	Queen Fan	24·125	25·125	29·375	30·000	27·875	110
1711	Viceroy	15·750	15·500	14·000	10·750	17·375	59
257	Turvey	16·000	16·625	19·125	13·875	20·750	69
1444	Cuballing	13·250	14·125	15·000	9·625	16·125	55
1536	Barwang	8·750	9·875	12·000	5·000	13·750	39
159	Gluyas Early (Control)	26·750	26·875	25·000	20·750	27·750	100
159	Gluyas Early (Control)	21·750	26·500	22·000	19·000	27·000	100
986	Bald Early	23·500	26·000	21·500	24·250	33·500	99
...	M.D.3 (Toby's Tusk x Nabawa)	16·000	12·375	11·000	12·750	22·625	57
1614	Bena	15·500	16·875	13·250	13·125	23·500	63
1037	Wilfred	17·125	15·125	14·125	11·375	17·750	58
1277	Niloc	12·625	14·500	10·000	10·000	16·000	48
159	Gluyas Early (Control)	31·375	29·625	29·250	25·125	28·750	100
159	Gluyas Early (Control)	26·875	31·875	23·625	23·500	26·750	100
...	M.D.17 (Comeback x Jap)	13·875	12·375	13·125	11·500	15·500	48
...	C.47 (Minister x Toby's Tusk)	19·125	20·750	15·250	14·375	20·500	65
...	C.48 (Fortune x Gluyas Early)	22·500	21·750	18·750	16·125	22·000	73
...	C.49 (Fortune x Gluyas Early)	25·750	27·125	23·250	23·125	29·625	93
1627	Waratah	27·500	27·625	26·625	26·625	27·750	99
159	Gluyas Early (Control)	25·125	33·875	27·125	30·500	29·250	100
159	Gluyas Early (Control)	26·875	32·000	25·625	29·125	27·750	100
1710	Rajah	20·000	20·250	20·750	22·500	22·625	75
1199	Sultan	17·875	27·125	18·500	19·000	25·750	76
914	Caliph	23·500	35·750	24·875	22·500	32·875	97
...	C.46 (Minister x Toby's Tusk)	11·500	17·500	15·000	19·000	23·250	61
955	Newman's Early ...	26·375	34·000	29·750	32·250	35·125	111
159	Gluyas Early (Control)	29·875	31·750	24·625	26·125	31·625	100
159	Gluyas Early (Control)	22·250	33·500	24·000	27·750	31·375	100

* Discarded. Previous control (28·125ozs.) used for comparison.

GRAIN YIELDS—*continued.*

Reg. No.	Variety.	Grain Yields.					Average per cent. of all sections.
		Section A.	Section C.	Section E.	Section G.	Section J.	
		ozs.	ozs.	ozs.	ozs.	ozs.	%
1442	Geeralying	23·750	32·250	27·875	29·125	30·000	97
1507	Clarendon	12·500	25·500	22·250	23·375	24·750	73
...	M.D.14 (Nabawa x Bunyip)	22·375	22·375	21·625	25·250	26·250	81
...	M.D.18 (Federation x Bunyip)	7·000	6·625	6·625	9·500	8·875	25*f*
...	M.D.19 (Nabawa x Sunset)	13·875	18·500	18·375	23·000	23·750	66
159	Gluyas Early (Control)	29·625	35·375	30·000	30·875	29·625	100

f M.D.18, a very early maturing variety. Badly affected by frost and septoria.

The grain sections were harvested by hand and the sheaves threshed with the small machine thresher, care being taken to get the results as accurate as possible. After threshing, the grain from each variety was carefully weighed to the nearest eighth of an ounce, each section being weighed separately. From these weights the percentage yield of each variety was calculated, using the average yield of the two control plots to calculate that of each of the five varieties tested between each two controls. The yields obtained are as follow:—

HAY YIELDS.—*Average percentage results*, 1924–1926.

Reg. No.	Variety.	1924.	1925.	1926.	Average
		%	%	%	%
986	Bald Early	100	100	89	96
1536	Barwang (Cowra 30)	89	92	87	89
1614	Bena	...	87	95	91
914	Caliph	108	99	104	104
...	C 46 (Minister x Toby's Tusk) ...	...	...	81	81
...	C 47 (Minister x Toby's Tusk) ...	...	...	84	84
...	C 48 (Fortune x Gluyas Early) ...	...	...	97	97
...	C 49 (Fortune x Gluyas Early)... ...	...	...	99	99
1507	Clarendon	97	95	104	99
1444	Cuballing	102	88	84	91
911	Fortune	99	74	88	94
1442	Geeralying	99	93	109	100
159	Gluyas Early (Control)	100	100	100	100
1270	Major	93	74	83	83
...	M.D. 3 (Toby's Tusk x Nabawa) ...	98	96	93	96
...	M.D. 14 (Nabawa x Bunyip) ...	83	67	88	79
...	M.D. 17 (Comeback x Jap) ...	...	81	88	84
..	M.D. 18 (Federation x Bunyip ...	...	85	85	85
...	M.D. 19 (Nabawa x Sunset)	...	...	88	88
834	Minister	81	51	74	69
955	Newman's Early	92	87	100	93
1277	Niloc	97	77	83	86
1513	Onas	97	71	86	85
1194	Queen Fan	113	103	95	104
1710	Rajah (Vic.)	...	...	95	95
1190	Roseworthy	91	69	73	78
1199	Sultan	103	109	100	104
257	Turvey	103	91	89	94
1711	Viceroy	...	...	71	71
1627	Waratah	...	...	113	113
1037	Wilfred	107	87	92	95

GRAIN YIELDS.—*Average percentage results for three years* 1924 *to* 1926.

Reg. No.	Variety.	1924.	1925.	1926.	Average.
		%	%	%	%
986	Bald Early...	116	116	99	110
1536	Barwang (Cowra 30)	81	86	39	69
1614	Bena	...	94	63	78
914	Caliph	121	120	97	113
...	C.46 (Minister x Toby's Tusk)	...	...	61	61
...	C.47 (Minister x Toby's Tusk)	...	...	65	65
...	C.48 (Fortune x Gluyas Early) ...	...	...	73	73
...	C.49 (Fortune x Gluyas Early) ...	...	...	93	93
1507	Clarendon	62	65	73	67
1444	Cuballing	117	105	55	92
911	Fortune	86	87	79	84
1442	Geeralying	94	79	97	90
159	Gluyas Early (Control)	100	100	100	100
1270	Major	93	98	61	84
...	M.D.3 (Toby's Tusk x Nabawa) ...	111	122	57	97
...	M.D.14 (Nabawa x Bunyip)	64	60	81	68
...	M.D.17 (Comeback x Jap)	...	80	48	64
...	M.D.18 (Federation x Bunyip) ...	...	93	25	59
...	M.D.19 (Nabawa x Sunset)	...	...	66	66
834	Minister	85	83	66	78
955	Newman's Early	125	94	111	110
1277	Niloc	64	79	48	64
1513	Onas	95	85	77	86
1194	Queen Fan	124	135	110	123
1710	Rajah (Vic.)	...	...	75	75
1190	Roseworthy	102	94	67	88
1199	Sultan	116	95	76	96
257	Turvey	91	117	69	92
1711	Viceroy	...	...	59	59
1627	Waratah	...	...	99	99
1037	Wilfred	76	95	58	76

OAT "JUNIOR" FIELD TRIAL, 1926.

This trial was commenced in 1925, when in addition to the control—"Burt's Early"—four varieties were included. This year another variety was added. The trial was planted on 22nd April. The land was in rather a lumpy condition, and with light falls of rain following planting, a fair amount of the seed malted. Germination was very slow and irregular, no useful rains falling towards the end of May. During June and July the plot became water-logged in patches, and growth generally was very unsatisfactory. Very little information could be gained from the trial, and the resultant yields cannot be taken as a guide to the possibilities of the varieties under test.

"Scotch Grey"—P. 1501—has again indicated its ability to yield well but owing to its short growth and more especially the colour and quality of its grain, it is not considered a desirable variety.

"Glen Innes, No. 5"—P. 1412—appears to be rather too late for this district.

"Glen Innes, No. 6"—P. 1470.—This is an oat somewhat similar to "Lachlan." Rather earlier maturing, fairly plump grain with stout awn, which appears to thresh off more easily.

"Buddah"—P. 1632—is a selection from "Sunrise," about as early maturing as "Burt's Early." Grain fairly plump, similar to "Mulga" oats.

This year the growth was too short to judge its standing quality; being normally a tall variety, it may break down like "Sunrise." It stands fairly well in the test rows.

"M.D. 22."—A skinless type selected from a natural cross between "Algerian" and "Skinless" oats. Yields fairly well, and does not shed its grain. In a small paddock plot in 1925 it stripped fairly well with the harvester, although the growth was exceptionally short that year.

The yields are as hereunder:—

HAY YIELDS 1926.

Reg. No.	Variety.	Average Height when Cut.	Hay Yields.			Average per cent. of all Controls.
			Section C.	Section E.	Section G.	
		inches.	lbs.	lbs.	lbs.	per cent.
1494	Burt's Early (Control)	36	8·75	8·50	8·00	100
1632	Buddah	38	6·50	6·75	6·75	86
1470	Glen Innes, No. 8	37	6·50	7·00	5·00	86
1412	Glen Innes, No. 5	34	6·75	6·50	7·25	89
...	M.D. 22	38	6·50	7·75	6·50	89
1501	Scotch Grey ...	31	7·75	6·75	7·75	96
1494	Burt's Early (Control)	36	7·00	7·25	7·00	100

GRAIN YIELDS 1926.

No.	Variety.	Grain Yields.					Average per cent. of all Sections.
		Section B.	Section D.	Section F.	Section H.	Section J.	
		ozs.	ozs.	ozs.	ozs.	ozs.	%
1494	Burt's Early (Control)	17·125	19·500	19·375	12·375	21·500	100
1632	Buddah	26·625	19·000	17·625	21·875	22·375	128
1470	Glen Innes, No. 8 ...	21·375	20·875	12·625	10·875	13·625	92
1412	Glen Innes, No. 5 ...	18·250	17·500	9·375	10·125	9·750	76
...	M.D. 22	21·250	16·000	14·625	11·750	10·000	88
1501	Scotch Grey	32·000	25·500	20·000	22·250	14·000	134
1494	Burt's Early (Control)	20·250	17·750	15·750	13·750	13·750	100

AVERAGE PERCENTAGE RESULTS, 1925 AND 1926.

Reg. No.	Variety.	Grain.			Hay.		
		1925.	1926.	Average.	1925.	1926.	Average.
		per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
1632	Buddah	...	128	128	...	86	86
1494	Burt's Early (Control)	100	100	100	100	100	100
1412	Glen Innes, No. 5 ...	131	76	103	86	89	87
1470	Glen Innes, No. 8 ...	142	92	120	93	80	86
...	M.D. 22	125	88	106	95	89	92
1501	Scotch Grey	191	134	162	118	96	107

PASPALUM DILATATUM (POIRET).

W. M. Carne, F.L.S., and C. A. Gardner.

Paspalum dilatatum is a perennial grass which stands out as the most permanent and most important of the grasses (as distinguished from clovers, etc.) in use in *permanent* pasture mixtures on practically all types of soil on reasonably suitable locations in the South-West of Western Australia. Over a wide range of climatic conditions in the South-West, where it has been tried, its permanence is constantly being demonstrated, and its value is such that where conditions are suitable it should be cultivated.

Originally a native of South America, this grass is now extensively cultivated in many warm countries. The name *Paspalum* is from the Greek *paspalos*—millet; *dilatatum* referring to the widened rhachis of the panicle branches.

Paspalum dilatatum should be sown preferably in low, moist situations, although very good results have been obtained on good quality soil on hillsides in the South-West. Instances of this have been noted at Denmark and Kirrup. Although it will grow on all types of soil, ranging from stiff clay to sandy loam, the best results are obtained on rich alluvial flats.

The period during which Paspalum dilatatum makes the most growth is from October to May, inclusive. The most rapid growth is made during January, February and March under moist conditions. This growth, however, will much depend upon the manner in which the grass is stocked during the mid-summer months. Many instances of the failure of this grass to spread have been due to the excessive stocking which usually takes place during the dry summer months, thus preventing the plants from seeding, and so spreading over the bare patches in the field, and compelling the grass to make its development by enlarging its root system rather than striking fresh plants as would occur were the plants allowed to seed, say, in February. As this grass is usually the most green of all the pasture grasses during the hot summer months, stock are continuously feeding upon it, and it speaks volumes for its hardiness that it is able to withstand such close feeding with so little protection to its root crowns—a treatment which few tussock-forming grasses can endure. Overstocking is the principal explanation of the adverse criticism of Paspalum sometimes heard from stockowners.

Although Paspalum dilatatum under Western Australian conditions is somewhat difficult to establish, its value as green feed in the summer is unsurpassed. Its capability to stand up to very heavy stocking in the dry months is better than that of other grasses, and it is not uncommon to find this grass the only green feed on the pastures available to stock during the long summer.

Where White Dutch Clover (*Trifolium repens*) is sown in conjunction with Paspalum, there is provided a well balanced ration with each mouthful, the White Dutch Clover responding very quickly to showers and growing well into the winter and early spring.

Planting and Care of Pasture.—Seeding should take place in the spring for preference, Paspalum dilatatum being a warmth-loving plant. Good results are obtained with autumnal sowing where the rains are early, and while the ground is still warm. Late autumn seeding is generally unsatisfactory. Planting seed at the rate of 10 to 12 lbs. per acre is recommended.

In all cases when it is intended to lay down Paspalum, the addition of 1 to 2 lbs. of White Dutch Clover is strongly recommended, since this clover has proved to be the most adaptable under all conditions to grow with Paspalum, the plants appearing to have a special affinity to each other. In purchasing Paspalum seed growers are advised to secure only hand-shaken or hand-picked seed.

The sed bed should on all occasions be firm. This grass succeeds well on "sowing on the burn" conditions where there is a good deposit of ashes following the burn on firm ground. Fertiliser should be applied at the rate of 1½ cwt. superphosphate and ¼ cwt. sulphate of ammonia per acre.

Removal of stock is recommended during the growing season to permit the grass to recuperate after heavy stocking, and, when the removal of stock, the spreading of the animal manure by running the harrow over, turned upside down, in order to break up the manure. Top-dressing in the early spring with 1 cwt. of superphosphate and ¼ cwt. of sulphate of ammonia is strongly recommended.

[The preceding notes have been compiled in collaboration with Mr. P. G. Hampshire, Superintendent of Dairying.]

Paspalum seed comes mainly from New South Wales. The seed is not truly seed, but consists of the dried florets which may or may not contain formed seed. Seed on the market here contains from 30 to 50 per cent. of formed seed. Inferior lines contain under 30 per cent., while special samples go over 70 per cent. The germination is very variable, new season's seed giving from 5 per cent. to 20 per cent. of the so-called seed, and correspondingly higher for the formed seed. The seed when harvested has not reached its full state of maturity, and consequently it is usually found that the maximum capacity for germination is not reached until 6-12 months later. Germination results of new seed cannot, therefore, be relied upon entirely. The percentage of formed seed in new season's seed is a more reliable guide to quality. Good average samples should have 40 per cent. or over of formed seed, and a bushel weight of at least 28 lbs. Superior lines should have 70 per cent. or more of formed seed, and a bushel weight over 30 lbs.

Description of Plant.—A perennial grass with clustered, tall, erect stems attaining a height of six feet and with a creeping root stock. Leaves long, soft, with a lance-shaped ligule and ribbed leaf sheath. Panicle of several distant, more or less alternately arranged heavy spikes. Spikelets ovate-acute, crowded, one-flowered, not awned, densely packed in four rows along one side of the flattened rhachis of the spike, the lower spikelet of each pair on a short, the upper on a long-jointed, stalk. Glumes, three: the two outer ones broad-oval, acute; the lower one, 5-nerved, villous on the back and fringed with long silky hairs, the upper glume 7-nerved. Flowering glume shorter than the outer glumes, almost circular, the edges in-rolled and enclosing the small palea, hard, minutely pitted.

For purther particulars *see* plate.

Paspalum dilitatum, Poiret.

Explanation of Plate.

A—Portion of plant.
B—Spike.
C. and D—Details of spikelet.

FERTILISER EXPERIMENTS WITH POTATOES.

FARMERS' TRIALS AT BUREKUP—1926.

G. N. LOWE,
Senior Potato Inspector.

In continuance of the system of fertiliser experiments on the properties of potato growers in the various districts, a further trial was planted on the property of Mr. C. L. Clarke, Burekup, on the 19th July and harvested on the 30th November, 1926.

The seed used was "Delaware," similar to that planted by Mr. Clarke in the remainder of his crop and of a special strain grown previously in Benger Swamp from root selected stock, and applied cut at about 12 cwt. per acre.

It may be well to repeat that the object of these experiments is to determine the composition of a fertiliser for use in that particular soil in which the trial is conducted and so compounded as to give a greater return at a cheaper cost. The early impression on the part of numerous growers in the various centres where such tests were instituted, that such were actually demonstrations and not experiments, has now lost ground almost completely, with a consequent additional interest and value to these men.

The land made available was typical of that generally planted to the winter crop in that area and of fair average quality.

The basis of comparison was afforded in the Control Plots, in which a complete fertiliser of high grade was provided and in which it was considered was an actual excess of each plant food necessary for the crop, so that yields should not be detrimentally influenced by insufficiency in any one of them.

The other plots were then fertilised to ascertain:—

(1) The effect of reducing the supply of nitrogen.

(2) The effect of reducing the supply of the soluble phosphoric acid.

(3) The effect of the reduction and absence of potash.

East plot was arranged in triplicate 2½ chains in length in each series—viz., Nitrogen, Phosphoric Acid, and Potash.

The plan of the Nitrogen series is shown below and gives the plant foods applied per acre, and the quantity of fertiliser per acre from which they were derived:—

POTATO FERTILISER TRIAL (BUREKUP—WINTER PLANTING), 1926.

Rows planted 30in. apart and 2½ chains long in triplicate equalling 3/100 of an acre

Nitrogen Series.

Plot No.	Plant Food.	Plant Food per acre.	Manuring per acre.
1 (Control) ...	Nitrogen	100 lbs.	500 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	300 ,,	1,430 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash
2	Nitrogen	70lbs.	350 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	300 ,,	1,430 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash
3	Nitrogen	40 lbs.	200 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	300 ,,	1,430 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash
4 (Control) ...	Nitrogen	100 lbs.	500 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	300 ,,	1,430 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash

The weather experienced during the planting of the experiment was atrocious and it was only with great difficulty that the work could be carried out, but as operations had already been considerably delayed because of unsuitable conditions, it was considered advisable to carry on.

The average rainfall for Burekup from 1st July to 30th November is 25.34 inches, but that actually recorded for the period in 1926 was 38.29 inches, or 13 inches more than the average.

Such conditions operate very materially against proper fertiliser action and naturally affect results to the same extent. Particularly is this likely to occur in the nitrogen portion of a fertiliser, as this ingredient leaches out more readily than any other plant food provided in the mixture. Probably in the case where unsprouted seed is planted and which does not show above ground for 7 or 8 weeks later, a heavy loss of expensive nitrogen when applied at the same period occurs, and possibly sounder practice would be to use sulphate of ammonia or nitrate of soda as a top dressing. This dressing might be given in two applications, one as the crop breaks through the ground, and another, say, three weeks later.

The yields of the Nitrogen Series are as shown in Table "A."

Table A.—*Nitrogen Series.*

Plot.	Fertiliser per acre.	Yield in lbs. per 1/100 acre.	Computed yield in tons per acre.	Natural yield in lbs. per 1/100 acre.	Natural yield in tons per acre.	Percentage yield.
			T. H. Q. L.		T. H. Q. L.	
1 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash...	112	5 0 0 0	112	5 0 0 0	100
2	350lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash	117	5 4 1 24	121	5 8 0 4	96
3	200lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash...	108	4 16 1 20	131	5 16 3 24	83
4 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	140	6 5 0 0	140	6 5 0 0	100
5	350lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash...	126	5 12 2 0	132	5 17 3 12	96
6	200lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	112	5 0 0 0	123	5 9 3 8	91
7 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. of Super.... ... 200lbs. Sulp. of Potash ...	115	5 2 2 20	115	5 2 2 20	100
8	350lbs. Sulp. of Ammonia 1,430 lbs. Super. ... ... 210lbs. Sulp. of Potash ...	128	5 14 1 4	115	5 2 2 20	110
9	200lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash . .	129	5 15 0 20	115	5 2 2 20	110
10 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	115	5 2 2 20	115	5 2 2 20	100

SUMMARY.

Average of Plots 1–10, showing variation in plant food per acre yield—

	per cent.
(Control)—100lbs. Nitrogen	100
70lbs. Nitrogen	100
40lbs. Nitrogen	95

On comparing the average percentage yields from which the indications are most readily drawn, it would appear that the application of 350lbs. of sulphate of ammonia applied in the furrow, at planting, and providing 70lbs. of nitrogen per acre, gives an equal result with the heavier application in the controls, and as the nitrogen is again reduced, so the crop diminishes.

Phosphoric Acid Series.

The plan of this follows, showing the variations of this plant food and how derived:—

Phosphoric Acid Series.

Plot No.	Plant Food.	Plant Food per acre.	Manuring per acre.
11 (Control) ...	Nitrogen	100 lbs.	500 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	300 ,,	1,430 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash
12	Nitrogen	100 lbs.	500 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	200 ,,	950 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash
13	Nitrogen	100 lbs.	500 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	100 ,,	475 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash
14 (Control) ...	Nitrogen	100 lbs.	500 lbs. Sulphate of Ammonia
	Phosphoric Acid ...	300 ,,	1,430 ,, Superphosphate
	Potash	100 ,,	210 ,, Sulphate of Potash

The yields in this section are as shown in Table "B."

TABLE B.—*Phosphoric Series.*

Plot.	Fertiliser per acre.	Yield in lbs. per 1/100 acre.	Computed yield in tons per acre.	Natural yield in lbs. per 1/100 acre.	Natural yield in tons per acre.	Percentage yield.
			T. H. Q. L.		T. H. Q. L.	
11 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	140	6 5 0 0	140	6 5 0 0	100
12 ...	500lbs. Sulp. of Ammonia 950lbs. Super. ... ... 210lbs. Sulp. of Potash ...	142	6 6 3 4	146	6 10 1 12	95
13 ...	500lbs. Sulp. of Ammonia 475lbs. Super. ... ... 210lbs. Sulp. of Potash ...	129	5 15 0 20	151	6 14 3 8	85
14 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	157	7 0 0 20	157	7 0 0 20	100
15 ...	500lbs. Sulp. of Ammonia 950lbs. Super. ... ... 210lbs. Sulp. of Potash	134	5 19 2 16	161	7 3 3 0	83
16 ...	550lbs. Sulp. of Ammonia 475lbs. Super. ... ... 210lbs. Sulp. of Potash ...	131	5 16 3 24	165	7 7 1 8	79
17 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	169	7 10 3 16	169	7 10 3 16	100
18 ...	500lbs. Sulp. of Ammonia 950lbs. Super. ... ... 210lbs. Sulp. of Potash ...	143	6 7 2 20	161	6 7 2 20	89
19 ...	500lbs. Sulp. of Ammonia 475lbs. Super. ... ... 210lbs. Sulp. of Potash ...	137	6 2 1 8	154	6 17 2 0	88
20 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	147	6 11 1 0	147	6 11 1 0	100

SUMMARY.

Average of Plots 11–20 showing variation in plant food per acre—

	percentage yield.
(Control)—300lbs. Phosphoric Acid	100
200lbs. Phosphoric Acid	89
100lbs. Phosphoric Acid	84

By again consulting the average percentage yield it is noticeable that where the reduction of phosphoric acid is made, so the yield falls, and it would seem that the heavier application is necessary.

Potash Series.—As the fertiliser generally used in the Burekup district does not contain potash, provision was made for the inclusion of a plot with a similar mixture, and the other plots show the addition of this plant food.

The plan of this section follows:—

Potash Series.

Plot No.	Plant Food.	Plant Food per acre.	Manuring per acre.
21 (Control) ...	Nitrogen ... ... Phosphoric Acid ... Potash	100 lbs. 300 „ 100 „	500 lbs. Sulphate of Ammonia 1,430 „ Superphosphate 210 „ Sulphate of Potash
22	Nitrogen ... ... Phosphoric Acid ... Potash	100 lbs. 300 „ 100 „	500 lbs. Sulphate of Ammonia 1,430 „ Superphosphate 105 „ Sulphate of Potash
23	Nitrogen ... ... Phosphoric Acid ... Potash	100 lbs. 300 „ ...	500 lbs. Sulphate of Ammonia 1,430 „ Superphosphate ... Sulphate of Potash
24 (Control) ...	Nitrogen ... ... Phosphoric Acid ... Potash	100 lbs. 300 „ 100 „	500 lbs. Sulphate of Ammonia 1,430 „ Superphosphate 210 „ Sulphate of Potash

The yields of this section are as shown in Table "C."

TABLE C.—*Potash Series.*

Plot.	Fertiliser per acre.	Yield in lbs. per 1/100 acre.	Computed yield in tons per acre.	Natural yield in lbs. per 1/100 acre.	Natural yield in tons per acre.	Percentage yield.
			T. H. Q. L.		T. H. Q. L.	
21 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	102	4 11 0 8	102	4 11 0 8	100
22	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 105lbs. Sulp. of Potash ...	125	5 11 2 12	114	5 1 3 4	109
23 ...	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... No lbs. Sulp. of Potash	127	5 13 1 16	127	5 13 1 16	100
24 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	139	6 4 0 12	139	6 4 0 12	100
25 ...	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 105lbs. Sulp. of Potash ...	155	6 18 1 16	135	6 0 2 4	115

TABLE C.—*Potash Series—continued.*

Plot.	Fertiliser per acre.	Yield in lbs. per 1/100 acre.	Computed yield in tons per acre.	Natural yield in lbs. per 1/100 acre.	Natural yield in tons per acre.	Percentage yield.
			T. H. Q. L.		T. H. Q. L.	
26 ...	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... No lbs. Sulp. of Potash ...	152	6 15 2 26	131	5 16 3 24	116
27 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulp. of Potash ...	127	5 13 1 16	127	5 13 1 16	100
28 ...	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... 105lbs. Sulp. of Potash ...	163	7 5 2 6	129	5 15 0 20	126
29 ...	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... No lbs. Sulp. of Potash ...	144	6 8 2 8	131	5 16 3 24	109
30 (Control)	500lbs. Sulp. of Ammonia 1,430lbs. Super. ... ... 210lbs. Sulpn. of Potash	133	5 18 3 0	133	5 18 3 0	100

SUMMARY.

Average of Plots 21-30 showing varieties of plant food per acre—

	percentage yield.
(Control)—100lbs. Potash	100
50lbs. Potash	117
No lbs. potash	108

From the average percentage yields it will be noticed that the results are contradictory and would imply that some factor either as to soil and weather has intervened to cause this inconclusiveness for this one test in the matter of the potash necessary.

The above results suggest that this soil contains sufficient potash for the needs of the crop from the standpoint of yield.

CHANGE OF SEED POTATO TRIAL.

In conjunction with the Fertiliser Trial was conducted a test of the "Delaware" drawn from different potato districts to determine if possible the value of the change into the high lands at Burekup.

The test was arranged in triplicate plots of 2½ chains in length and the seed in the "control" was the best obtainable from Benger Swamp, and derived from a root selected strain.

Compared with this was:—

(1) Selected roots from Young's Siding.
(2) Ordinary large seed from this area.
(3) Benger Swamp seed once grown at Young's Siding and returned to Burekup to be tested against the same strain retained in the district.
(4) Large seed from the Peel Estate grown on peat soil, and
(5) Large seed grown on red soils on the Collie River flats.

All the seed was, of course, cut, and the treatment as to planting and fertilising was identical.

The result of the experiment, together with the computed yields in tons per acre and the percentage yields, is as shown in Table "D" (attached).

It will be seen from this table that the selected roots from Young's Siding gave an increase of 27 per cent. over the average of the "controls," and indicating the value of root selected seed over the following plot of graded large seed from the same locality to the extent of 5 per cent.

The result of the next class of seed, Benger once grown at Young's and returned to compare with the same strain retained at Burekup, as used in the "Controls," is very interesting, and shows an increase of 9 per cent. in favour of the change to Young's Siding and back.

A quantity of Certified Seed from the same crop as Sections 1 and 2, grown in the South-West, was just as successful in every instance, and helps to emphasise the value of this strain of "Delaware."

TABLE D.—CHANGE SEED TRIAL.

GROWN AT BUREKUP ON MR. C. L. CLARKE'S PROPERTY.

Planted 19th July, 1926—Harvested 30th November, 1926—Rate per acre, 10cwt.

Fertiliser: That used by Mr. C. L. Clarke and applied at the same rate.

Average obtained from three plots each 1/100th acre in size and triplicated—

Variety of Seed.	Yield in tons per acre.	Percentage yield.
	T. H. Q. L.	
Young's Siding Selected Roots	8 2 2 0	127
Young's Siding Ordinary Seed	7 16 1 0	122
Benger—Once grown at Young's Siding ...	7 0 0 20	109
Controls	6 7 2 20	100
Peel Estate	4 18 1 26	76
Collie Flats	3 16 3 4	60

One big element in favour of this seed is the fact that owing to having been dug in March and April, it is nicely sprouted by July, and of course sprouted seed has a distinct value over that unsprouted. Should such seed be obtained for later planting it is essential that it be "racked" to check the sprouts by "greening."

FIELD EXPERIMENTS WITH WHEAT AT THE MERREDIN EXPERIMENT FARM.

I. Thomas, Superintendent of Wheat Farms.

J. H. Langfield, Manager Merredin Experiment Farm.

The rainfall as recorded at the farm for the year 1926, together with the average rainfall for the past 15 years, is as under:—

Year.	Jan.	Feb.	Mar.	April.	Growing Period.						Total, May to Oct.	Nov.	Dec.	Yearly Total.
					May.	June.	July.	Aug.	Sep.	Oct.				
1926 ...	...	26	199	60	91	202	267	94	100	71	825	35	6	1,151
Average 15 years	63	55	77	79	151	172	184	141	92	82	822	37	63	1,176

Though unusually early heavy rains fell in March, and those were followed only by light showers during April, a dry spell succeeded these until the middle of May. The result was that crops planted during April germinated irregularly, and in some cases malted. Following the rains in May, and until the beginning of September, the rains were excellent. As a result of the good rainfall and the mild weather conditions which also prevailed, the crops made vigorous growth, the foliage being very dense.

During the early part of September no rain fell, and heavy frosts in the mornings with hot drying winds during the day were experienced. The conditions following the mild weather conditions previously experienced affected the crops injuriously, and had it not been for the timely falls during the latter part of September, the results would have been disastrous, but fortunately further late rains were experienced in October, with the result that moderately good grain yields were obtained from the early season crops of the later maturing varieties or from the later sowings of earlier varieties.

RATE OF SUPERPHOSPHATE EXPERIMENT.

This experiment has been carried out at the Merredin Experiment Farm each year since 1923. The land for last year's trials was prepared by ploughing during the month of June, 1925, and subsequently cultivated with a springtyne cultivator in September. It was harrowed after rain in March, cultivated with a tandem disc in April, and again with a springtyne prior to seeding.

The variety "Gluyas Early" was planted at the rate of 45 lbs. of seed per acre on the 20th May, and superphosphate was applied to suit the requirements of the experiment. On the plots which received the heavier dressing it was noticed that the crop was more dense, contained fewer weeds, and made more vigorous growth than the control plot which received the lighter dressing.

The results for last year, together with the average results for the past four years, are given hereunder—

RATE OF SUPERPHOSPHATE EXPERIMENT.

Hay Results.

Variety "Gluyas Early"—Planted 20th May, 1926.

Rate of Superphosphate per acre.	Computed yields per acre.			Average yields, 1926.	Percentage yields, 1926.	Percentage yields, 1923–26.
	Section 1.	Section 2.	Section 3.			
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	%	%
150lbs. ...	45 3 20	47 1 12	45 3 12	46 1 12	113	114
75lbs. ...	41 0 0	41 2 16	40 0 24	40 3 20	100	100
225lbs. ...	49 0 16	47 0 16	48 2 24	48 1 12	118	120

Grain Results.

Rate of Superphosphate per acre.	Computed yields per acre.					Average yield, 1926.	Percentage yield, 1926.	Percentage yield, 1925–26.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.			
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
150lbs. ...	20 32	23 44	21 44	23 4	21 4	22 0	122	111
75lbs. ...	19 20	20 56	18 0	20 24	19 12	19 36	100	100
225lbs. ...	24 0	22 24	23 52	21 4	23 44	23 4	117	117

These results in no way agree with the usually accepted theory that the heavier applications of superphosphate are detrimental to the wheat crop should a dry spell be experienced during the growing period, as was the case this year during the early part of September.

RATE OF SEEDING EXPERIMENT.

This experiment has been carried out continuously for the past 12 years with two varieties—a very early and sparse stooling variety, and a mid-season and free stooling variety.

The land for this year's trials had been prepared by being ploughed 4in. to 5in. deep with a heavy disc plough; cultivated in September with a spring-tyne cultivator; harrowed after rain during the last week in March; and cultivated with a tandem disc in April.

The mid-season variety was planted on the 20th April. The germination was patchy, a small percentage malting; some patches germinated immediately, whilst others germinated several weeks later.

At the time of planting the very early variety plots the land was in excellent order, and the germination was good.

This experiment suffered considerably from the frosts and dry weather conditions experienced in September, and from which they never recovered.

The results obtained last year, together with the average results for the past 12 years, are given hereunder:—

RATE OF SEEDING EXPERIMENT.

Midseason variety "Nabawa"—Superphosphate 22 per cent, 90lbs. per acre. Planted 20th April, 1926.

Rate of Seed per acre.	Computed yields per acre.			Average yields, 1926.	Percentage yields, 1926.	Percentage yields, 12 years.
	Section 1.	Section 2.	Section 3.			
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	%	%
30lbs.	41 0 16	39 1 20	40 3 12	40 2 0	98	94
45lbs.	41 3 4	41 1 4	40 2 24	41 1 4	100	100
60lbs.	41 1 4	43 3 4	40 0 8	41 2 24	101	100

Early variety "Florence"—Planted 14th May, 1926.

Rate of Seed per acre.	Computed yields per acre.			Average yields, 1926.	Percentage yields, 1926.	Percentage Yields, 12 years.
	Section 1.	Section 2.	Section 3.			
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	%	%
30lbs.	41 2 8	39 1 12	38 1 20	39 3 4	97	96
45lbs.	42 0 8	40 2 16	40 0 24	41 0 0	100	100
60lbs. ...	43 0 8	41 2 0	41 1 4	41 3 20	102	96

RATE OF SEEDING EXPERIMENT.

GRAIN RESULTS.

Midseason variety "Nabawa."

Rate of Seed per acre.	Computed yields per acre.					Average yield, 1926.	Percentage yield, 1926.	Percentage yield, 12 years.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.			
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
30lbs. ...	18 48	18 0	17 12	16 24	18 24	17 44	94	95
45lbs. ...	19 4	17 52	18 8	18 40	20 0	18 48	100	100
60lbs. ...	19 12	20 8	18 16	19 4	22 0	19 44	105	100

Early variety "Florence."

Rate of Seed per acre.	Computed yields per acre.					Average yield, 1926.	Percentage yield, 1926.	Percentage yield, 12 years.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.			
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
30lbs. ...	15 28	16 16	15 20	16 48	14 48	15 44	99	97
45lbs. ...	16 48	16 8	16 8	15 44	14 16	15 52	100	100
60lbs. ...	16 16	16 32	14 24	13 44	12 16	14 40	102	97

These results confirm the conclusion previously drawn that no advantage is gained by increasing the rate of seeding over 45 lbs. per acre with graded seed.

FERTILISER EXPERIMENT.

The object of this experiment is to determine whether the beneficial effects of fallowing are due solely to nitrogen fixation.

The experiment is duplicated, and therefore requires ten plots—six being fallowed, and four unfallowed. Two fallowed and two unfallowed plots received 25 lbs. of sulphate of ammonia per acre at the time of planting. All plots received the same quantity of seed and superphosphate, viz., 45 lbs. of seed and 96 lbs. of superphosphate per acre.

The fallowed plots were ploughed in June, 1925; cultivated with a springtyne cultivator in September; disc cultivated in March; harrowed early in April; and were again disc cultivated before seeding. They were in splendid order when sown.

The unfallowed plots were ploughed the last week in March, 1926, immediately after good rains had fallen, when the land was in good condition for this operation. They were twice cultivated before seeding, once with a springtyne cultivator and once with a disc, but the tilth on these plots was not equal to that on the fallow plots; the surface was more cloddy.

The germination on the fallowed plots was very fair, whilst on the unfallowed plots it was very slow and uneven and a small percentage malted. The unfallowed plots did not come away nearly so quickly, owing to the light rainfall and their cloddy surface.

The results for this year, together with the averages for the past two years, are given hereunder:—

FERTILISER EXPERIMENT.

GRAIN YIELDS.

Variety, "Nabawa."—Seed. 45lbs. per acre.

Treatment.	Fallowed.						Unfallowed.					
	Computed Yield per Acre.				Average.		Percentage 1926.	Percentage two years.	Computed Yield per Acre.		Average.		Percentage 1926.	Percentage two years.
	Section 1.		Section 2.		Section 3.				Section 1.		Section 2.			
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%	%	bus.	lbs.	bus.	lbs.	%	%
96lbs. super.	18	16	20	8	17	44	18	40	100	100	12	16	9	12	10	40	100	100
96lbs. super. 25lbs. sulph. ammonia	18	24	19	28	19	12	19	4	102	102	10	32	8	32	9	28	89	94

From the above it is apparent that the beneficial results which are obtained by fallowing heavy forest land are not entirely due to nitrogen fixation. They also illustrate in a striking manner the advantages to be gained when the land is fallowed.

LATE SEEDING EXPERIMENT.

This experiment has been conducted for the past four years. From the first and second years of the trials grain results only were obtained, but for the past two years both hay and grain plots have been planted, and the results obtained from both. The plots of each planting are repeated eight times, three being harvested for hay and five for grain.

The land on which the experiment was conducted was ploughed in June, 1925; cultivated in September with a springtyne cultivator; harrowed after rain in March; and cultivated with a tandem disc cultivator in April. In addition to this the June and July plots were cultivated with the springtyne cultivator at the time the June plots were seeded, and the July plots received a further cultivation at the time they were seeded. At the time of planting all plots were in good condition and free from weeds.

The results for this year, together with the averages for the four years the experiment has been conducted, are given hereunder:—

LATE SEEDING EXPERIMENT.

HAY RESULTS.

Variety "Gluyas Early"—Seed 45lbs.—Superphosphate 22 per cent., 96lbs.

Date of Planting.	Computed Yield per Acre.			Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield, 1923-1926.
	Section 1.	Section 2.	Section 3.			
1926.	cwt. qrs. lbs.	cwt. qrs. lbs.	cwt. qrs. lbs.	cwt. qrs. lbs.	%	%
May 13	40 3 20	41 3 4	41 1 4	41 1 12	100	100
June 15	27 0 8	27 3 4	26 2 16	27 0 16	65	64
July 17	17 1 12	17 1 4	14 2 16	16 1 20	40	42

GRAIN RESULTS.

Date of Planting.	Computed Yield per Acre.					Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield, 1923–26.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.			
1926.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
May 13 ...	22 0	22 40	23 12	23 20	23 52	23 4	100	100
June 15 ...	18 48	19 4	18 8	15 12	20 16	18 16	79	85
July 17 ...	10 24	10 8	11 12	12 0	12 56	11 20	49	54

The conclusion to be drawn from these results is that the month of May is the most suitable month for seeding in districts with similar climatic conditions as Merredin.

SEASONAL PLANTING EXPERIMENT.

This experiment has been conducted during the past three years for the purpose of ascertaining the month most suitable for planting the main wheat crop, and also to ascertain which type of wheat is most suited for earlier and later plantings. The land for this year's trials was ploughed during the month of June, 1925; cultivated during September; harrowed after rains in March; and later cultivated with the tandem disc cultivator.

The section planted in June received a further cultivation prior to being seeded. To suit the requirements of the experiment three plantings

were made as follows:—The early planting section on the 12th April; the mid-season planting on the 11th May; and the late planting section on the 15th June.

The varieties used for the experiment were "Yandilla King," representing the late maturing varieties; "Nabawa," the mid-season varieties; "Gluyas Early," the early varieties; and "Noongar," the very early varieties, with "Gluyas Early" planted in May as control. The plots of each section were repeated eight times, five of which were harvested for grain and three for hay. With the exception of the variety "Yandilla King" all the varieties in the section planted in April were affected by "Septoria," or failed to produce any grain owing to coming into ear out of season. Nabawa was only slightly affected, whilst the majority of the heads of the variety "Noongar" failed to produce any grain. This variety was also affected to a lesser extent in the plots planted on the 12th May, which indicates it is unsafe to plant this variety after the middle of May.

The results of this experiment this year, together with the results for the past three years, are set out in the tables hereunder:—

SEASONAL PLANTING EXPERIMENT—APRIL PLANTING.

Planted 15th April—Seed 45lbs.—Superphosphate 22%—96lbs.

Hay Yields.

Date of planting.	Variety.	Computed Yield per Acre.			Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield, 1925–26.
		Sec. 1.	Sec. 2.	Sec. 3.			
		cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	%	%
12th May	Gluyas Early (Control) ...	45 0 0	42 2 0	44 0 24	43 3 20	100	100
	Yandilla King	40 0 8	34 2 24	40 0 0	38 1 4	87	74
	Nabawa	42 2 0	38 2 8	42 3 20	41 1 12	95	80
15th Apl.	Gluyas Early	48 0 8	48 0 0	48 0 16	48 0 8	111	90
	Noongar (M.D. 15) ...	34 3 20	35 1 4	35 0 24	35 0 16	81	...
12th May	Gluyas Early (Control) ...	43 2 0	43 0 24	42 2 24	43 0 16	100	100

Grain Yields.

Date of planting.	Variety.	Computed Yield per Acre.					Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield, 1924-6.
		Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
12th May	Gluyas Early (Control)	21 12	21 28	18 40	22 16	22 16	21 12	100	100
15th Apl.	Yandilla King ...	14 56	18 16	14 40	18 40	18 32	17 4	80	79
	Nabawa	16 56	16 16	16 48	16 32	16 8	16 32	77	93
	Gluyas Early ...	14 32	11 12	13 28	11 4	10 48	12 16	56	76
	Noongaar (M.D. 15)	6 48	5 28	6 8	5 28	5 4	5 44	26	...
12th May	Gluyas Early (Control)	22 0	21 44	19 12	25 20	22 32	22 8	100	100

MERREDIN EXPERIMENT FARM.

SEASONAL PLANTING EXPERIMENT—MAY PLANTING.

Planted 11th May. Seed, 45lbs. Superphosphate 22%—96lbs.

HAY YIELDS.

Date of planting.	Variety.	Computed Yield per Acre.			Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield. 1924-26.
		Section 1.	Section 2.	Section 3.			
		cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	%	%
11th May	Gluyas Early (Control)	43 2 0	44 2 24	40 0 24	42 3 4	100	100
11th May	Yandilla King ...	39 0 8	33 2 0	30 2 0	34 1 12	81	76
11th May	Nabawa	35 1 4	34 2 8	33 2 16	34 2 0	81	84
11th May	Noongaar (M.D. 15)	35 0 24	37 1 12	36 2 24	36 1 20	87	...
11th May	Gluyas Early (Control)	41 1 20	41 2 0	42 0 0	41 2 16	100	100

GRAIN YIELDS.

Date of planting.	Variety.	Computed Yield per Acre.					Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield. 1924-26.
		Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
11th May	Gluyas Early (Control)	23 52	23 52	22 48	21 44	21 44	22 48	100	100
11th May	Yandilla King ...	24 48	22 0	22 8	19 20	20 32	21 44	96	94
11th May	Nabawa	17 44	19 44	21 36	18 56	19 12	19 28	86	100
11th May	Noongaar (M.D. 15)	17 20	18 8	17 52	17 28	17 52	17 44	80	...
11th May	Gluyas Early (Control)	22 40	23 4	21 28	20 24	22 8	22 0	100	100

MERREDIN EXPERIMENT FARM.

SEASONAL PLANTING EXPERIMENT—JUNE PLANTING.

Planted 15th June. Seed, 45lbs. Superphosphate, 22%—96lbs.

HAY YIELDS.

Date of Planting.	Variety.	Computed Yield per Acre.			Average Yield, 1926.	Percentage. Yield, 1926.	Percentage Yield, 1925-26.
		Section 1.	Section 2.	Section 3.			
		cwt. qrs. lbs.	cwt. qrs. lbs.	cwt. qrs. lbs.	cwt. qrs. lbs.	%	%
12th May	Gluyas Early (Control)	44 1 12	42 0 8	45 0 16	43 3 12	100	100
15th June	Yandilla King ...	25 3 20	23 0 8	23 1 20	24 0 16	55	54
15th June	Nabawa	27 0 0	24 3 20	26 0 16	26 0 0	59	58
15th June	Gluyas Early ...	30 3 20	30 2 0	31 2 8	31 0 0	71	74
15th June	Noongar (M.D. 15)	24 0 8	25 0 24	27 0 16	25 2 0	58	...
12th May	Gluyas Early (Control)	43 1 4	42 3 8	45 0 0	43 2 24	100	100

Grain Yields.

Date of Planting.	Variety.	Computed Yield per Acre.										Average Yield, 1926.		Percentage Yield, 1926.	Percentage Yield, 1924-26.
		Section 1.		Section 2.		Section 3.		Section 4.		Section 5.					
		bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%	%
12th May	Gluyas Early (Control)	23	4	21	36	22	56	23	4	22	322	22	40	100	100
15th June	Yandilla King	15	4	20	56	12	16	12	48	13	44	14	56	66	81
	Nabawa ...	18	40	17	20	16	56	18	16	18	48	18	0	79	94
	Gluyas Early ...	20	48	17	52	19	12	19	44	20	0	19	28	85	98
	Noongar (M.D. 15)	19	36	17	12	18	24	18	24	18	8	18	24	80	...
12th May	Gluyas Early (Control)	23	36	22	8	21	36	23	12	24	0	18	40	100	100

MERREDIN EXPERIMENT FARM.

Seasonal Planting Experiment—Percentage Results, 1924-26.

Hay Yields.

Varieties.	April.		May.		June.	
	1926.	1924–26.	1926.	1924–26.	1926.	1924–26.
Yandilla King	87	74	81	76	55	54
Nabawa	95	80	81	84	59	58
Gluyas Early	111	90	100	100	71	74
Noongaar (M.D. 15)	81	...	87	...	58	...

Grain Yields.

Varieties.	April.		May.		June.	
	1926.	1924–26.	1926.	1924–26.	1926.	1924–26.
Yandilla King	80	79	96	94	66	81
Nabawa	77	93	86	100	79	94
Gluyas Early	56	76	100	100	85	98
Noongaar (M.D. 15)	26	...	80	...	80	...

These results indicate that, when a crop is intended for hay, it may be planted with safety in April, but when intended to be harvested for grain better returns can be expected when it is sown in May. This is the practice generally adopted and can be continued with confidence

WHEAT VARIETY TRIAL.

The land was prepared by being ploughed with a heavy disc plough in June 1925. It was harrowed after rains in March and disc cultivated in April. The land was in excellent order when the plots were planted. The germination was very good. The plots were repeated eight times; five were harvested for grain and three for hay.

The results of both the hay and grain sections are given below, together with the averages for the four years 1923-1926 during which the experiment has been conducted under the present system.

MERREDIN EXPERIMENT FARM—WHEAT VARIETY TRIAL.

GRAIN YIELDS.

Variety.	Computed Yield per Acre.					Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield. 1923–26.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	%	%
Gluyas Early (Control) ...	23 52	23 52	22 48	21 44	21 44	22 48	100	100
Yandilla King	24 48	22 0	22 8	19 20	20 32	21 44	95	100
Gallipoli	22 0	21 36	22 8	20 32	20 32	21 20	94	100
Federation	17 4	19 20	19 20	17 20	17 36	18 8	80	93
Nabawa	17 44	19 44	21 36	18 56	19 12	19 28	85	102
Gluyas Early (Control) ...	22 24	23 52	23 28	22 24	22 8	22 48	100	100
Carrabin	21 20	22 48	22 16	22 56	19 12	21 44	95	93
Comeback	13 52	13 52	14 48	14 28	13 20	14 0	61	63
Gresley	18 8	18 0	19 44	17 52	18 8	18 24	81	88
Merredin	23 12	23 12	23 28	24 16	23 36	23 36	104	98
Gluyas Early (Control) ...	22 16	22 40	22 32	23 12	22 40	22 40	100	100
Canberra	23 28	24 48	24 40	25 28	22 56	24 16	108	105
S.H.J.	19 4	20 8	20 16	18 40	18 0	19 12	86	80
Florence	17 44	18 48	18 0	17 4	17 4	17 44	80	72
Noongaar (M.D. 15) ...	17 20	18 8	17 52	17 28	17 52	17 52	80	84
Gluyas Early (Control) ...	22 40	23 4	21 28	20 24	22 8	22 8	100	100

MERREDIN EXPERIMENT FARM—WHEAT VARIETY TRIAL.

HAY YIELDS.

Planted 11th May, 1926. Seed, 30lbs. per acre. Superphosphate, 96lbs.

Variety.	Computed Yield per Acre.			Average.	Percentage, 1926.	Percentage, 1923–26.
	Section 1.	Section 2.	Section 3.			
	tons cwt. qrs. lbs.	tons cwt. qrs. lbs.	tons cwt. qrs. lbs.	tons cwt. qrs. lbs.	%	%
Gluyas Early (Control) ...	43 2 0	44 2 24	40 0 24	42 3 7	100	100
Yandilla King	39 0 8	33 2 0	30 2 0	34 1 12	80	83·4 (1924–26)
Gallipoli	30 3 4	32 0 16	28 2 16	30 2 3	70·9	75·5
Federation	35 3 20	35 1 12	31 1 12	34 0 24	79·3	87·3
Nabawa	35 1 4	34 2 8	33 2 16	34 3 0	79·8	83·5
Gluyas Early (Control) ...	45 2 0	42 2 16	41 3 4	43 1 7	100	100
Carrabin	40 2 24	38 1 4	35 3 4	38 1 1	88·7	87·4
Comeback	37 0 24	36 2 24	35 2 8	36 3 0	85	79·5 (1925–26)
Gresley	39 2 16	40 0 0	37 2 24	39 0 13	91·6	95·0
Merredin	38 3 12	38 0 8	38 1 20	38 1 23	90·4	89·1
Gluyas Early (Control) ...	43 2 8	43 1 12	40 0 0	42 1 7	100	100
Canberra	47 0 16	47 0 8	44 0 0	46 0 8	109·1	104 (1925–26)
S.H.J.	37 2 8	38 0 24	35 2 0	37 0 11	88·1	82·4
Florence	41 1 4	41 2 8	40 0 8	40 3 25	97·7	92·1 (1925–26)
Noongaar	35 0 24	37 1 12	36 2 24	36 1 20	87·2	85·4
Gluyas Early (Control) ...	41 1 20	41 2 0	42 0 0	41 2 16	100	100

ELECTRO-CULTURE EXPERIMENT WITH WHEAT.

During the past 12 months, considerable publicity has been given in this State to an invention by M. Justin Christofleau, of France, which was claimed would revolutionalise agricultural production.

Alive to the interests of farmers in this State, and also in the absence of reliable experimental data, the Department, when three of the apparatus were made available for that purpose by the vendor, readily agreed to conduct an experiment to test the effects, if any, of electro-culture on wheat.

The object of the experiment, which was laid down under the supervision of the vendor, was to test the effect of the apparatus under practical field

conditions. The vendors claimed that, amongst other things, it would have the following results:—

(1) All crops are considerably increased.
(2) The enormous expense of manures is eliminated.
(3) Droughts do not affect crops.
(4) Everything grown by electricity is hastened by three weeks at least.

The land on which the experiment was conducted was typical heavy forest land which had been cleared of salmon and gimlet some years previously. It was fallowed with a heavy disc plough to a depth of 4 inches in August, 1925, and received cultivations with a springtyne implement during September, April and prior to planting.

Seven plots were used, each being one drill width wide and one-twelfth of an acre in area. Down the centre of each plot a trench 16 inches deep was opened out, and along the bottom of the trenches, in plots No. 2, 4, and 6, a soft No. 8 galvanised wire was laid. The south ends of these wires were each connected to an "Electro-culture Apparatus" placed on a pole 20 feet high at the south end of each plot. The plots were laid out due north and south in accordance with the directions. The purpose of trenching all seven plots instead of only the three connected with the apparatus was, in accordance with correct experimental procedure, to ensure that plots received the same treatment. The trenches were filled in and the plots again cultivated before planting, which took place on 20th June.

All the plots received exactly similar treatment, the variety "Merredin" being sown at the rate of 45 lbs. of seed per acre and superphosphate (22 per cent.) being applied at 96 lbs. per acre to the electro-cultured plots as well as to the controls, as was arranged with the vendor.

Field notes were kept of observations made at frequent intervals, but at no time from germination to maturity could any difference in growth be noticed between the electro-cultured and the non-electro-cultured plots. At flowering time all seven plots flowered simultaneously and matured normally. The following are the grain yields of plots:—

ELECTRO-CULTURE EXPERIMENT.

Grain Yields.

Variety "Merredin." Seed, 45lbs. per acre. Superphosphate (22%), 96lbs. per acre Planted 3rd June.

Treatment.	Computed Yield per Acre.		Percentage, 1926.
	bus.	lbs.	%
Plot 1—No apparatus	22	24	100
Plot 2—Electro-culture apparatus installed	21	48	97
Plot 3—No apparatus	22	24	100
Plot 4—Apparatus installed	22	0	98
No. 5—No apparatus	22	36	100
Plot 6—Apparatus installed	22	24	102
Plot 7—No apparatus	21	24	100
Average—			
No apparatus	22	12	100
Apparatus installed	22	4	99

From the results obtained it is evident, on the basis of the experiment conducted for one year only, that electro-cultured plots possessed no advantage over the non-electro-cultured plots in regard to—

(1) Increased yield.
(2) Earlier maturity.

It has recently been stated by the vendors, that very little results can be expected during the first season, and that the experiment should be continued to note any increase this season. However, the cropping of established wheat lands two years running in the Eastern wheatbelt, is against all principles of scientific practice, and a three-year rotation is employed on this farm, viz., fallow, wheat, stubble. The plots will still remain connected and observations will be made to see if any residual or accumulative effects can be noticed in the pasture.

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith, & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK AT METROPOLITAN FAT STOCK MARKETS DURING MONTHS OF DECEMBER, 1926, JANUARY AND FEBRUARY, 1927.

	December.				January.				February.			
	1	8	15	22	5	12	19	26	2	9	16	23
Sheep and Lambs	12,098	12,541	10,424	13,354	11,271	8,054	11,881	10,548	9,502	11,081	8,350	10,586
Cattle ...	891	574	663	809	700	565	777	762	599	522	653	703
Pigs ...	363	817	1,257	695	634	555	889	864	713	971	963	1,283

COMPARATIVE VALUES OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING MONTHS OF DECEMBER, 1926, JANUARY AND FEBRUARY, 1927.

	December.				January.				February.			
	1	8	15	22	5	12	19	26	2	9	16	23
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Mutton ...	5½	6	6½	6½	6½	6½	6½	6½	6	6½	6½	6½
Beef ...	5	5½	6	6½	6½	6	5½	5½	5	6	6	6
Pork ...	11½	11½	11½	11	11	11	11	11	11	11	10½	10
Bacon ...	8½	8½	8½	8½	8½	8½	8½	8½	8	8	8	8½

FIELD EXPERIMENTS WITH WHEAT AND OATS AT THE LIGHT LANDS FARM, WONGAN HILLS.

I. Thomas,

Superintendent of Wheat Farms.

The land on which the experiments were carried out was mainly of the "smoke-bush" type of country, and this is the first time it has been cropped. Other than by burning the scrub in its natural state, where possible, no clearing was done until it was ploughed with a disc cultivating type of plough during the winter months of 1925. The work done by the plough was considered satisfactory, although better work would have resulted had the land been properly cleared of scrub prior to ploughing.

During the latter part of January and the month of February the land was cross-cultivated with a disc implement followed by a scrub rake, and finally disc cultivated prior to seeding. The same disc implement was used for both the ploughing and the cultivation operations, but, as was the case the previous year, it was found that the depth of the implement could not be regulated as desired on the loose sand without attaching the specially made wide rims to the wheels. These rims are so made that they may be easily discarded, if required, when ploughing.

The depth of the initial cultivation (ploughing) was 3½ to 4 inches deep, and the second 2½ to 3 inches. This depth was found necessary to cut the scrub which had been left after the first ploughing. The final cultivation was slightly less. The disc type of drill was used with "coverers" attached.

The rainfall as recorded for last year, together with the average for the past 14 years at Wongan Hills, is shown in the table hereunder:—

Year.	Jan.	Feb.	Mar.	April.	Useful rains.						Total growing period.	Nov.	Dec.	Total
					May.	June	July.	Aug.	Sept.	Oct.				
1926 ...	22	11	111	136	143	256	439	179	112	137	1,266	120	...	1,666
14 years average	50	54	87	69	199	306	273	206	139	95	1,218	41	53	1,572

From the above it will be seen that the autumn rains were above the average; the total for the growing period was also above the average (48 points), but the individual months of this period, with the exception of July and October, were below it. This was not noticeable except for a short dry spell during the early part of September. This dry spell was not so detrimental to the crop under review as it was to the crops grown elsewhere on heavier soils. The continuous rains during July, which were above the average, were not beneficial, but rather the reverse, as the land became somewhat water-logged and cold, which affected the crops and retarded their growth.

The experiments conducted were—

The Rates of Superphosphate.
The Rates of Seeding with wheat and oats—two varieties of each.
Seasonal planting (wheat).
Variety trial (oats).

The initial plantings of the rotation experiments were also made, but the plots of the latter were not duplicated.

The plots of the Oat Variety Trial were repeated eight times, five of which were harvested for grain and three for hay.

The remainder of the experiments were repeated five times and were harvested for grain.

The results of the different experiments this year, together with the average for the past two years, are set out in the tables hereunder:—

RATE OF SEEDING EXPERIMENT (WHEAT).

In this experiment two varieties were planted—"S.H.J.," a very early and sparse stooling variety, and "Nabawa," a mid-season and freer stooling variety. The plots were planted on 13th May.

RATE OF SEEDING EXPERIMENT (WHEAT).

GRAIN YIELDS.

Midseason Variety "Nabawa."—Planted 13th May, 1926—Superphosphate 22 per cent., 150lbs.

Rate of Seed per acre.	Computed Yield per Acre.										Average Yield, 1926.		Percentage Yield, 1926.	Percentage Yield, 1925–26.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.					
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		
60lbs. ...	17	36	18	0	17	20	18	0	17	20	17	36	98	100
45lbs. ...	19	20	17	20	19	28	16	48	16	32	17	52	100	100
90lbs. ...	18	48	19	20	*		*		17	4	18	24	103	101

* Owing to an accident when being planted the yield obtained from these plots is so obviously below normal that the results are not given.

Early Variety "S.H.J."—Planted 14th May, 1926.

Rate of Seed per acre.	Computed Yield per Acre.										Average Yield, 1926.		Percentage Yield, 1926.	Percentage Yield, 1925–26.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.					
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		
60lbs. ...	12	56	16	16	15	12	15	28	15	20	15	4	106	102
45lbs. ...	10	48	14	32	15	4	15	36	15	20	14	16	100	100
90lbs. ...	12	48	15	52	16	0	15	12	15	12	15	4	106	104

This year's results, and also the average results of the mid-season variety ("Nabawa") are remarkably even, which again indicate that the conclusion arrived at from the experiments conducted at Merredin was correct, viz., that 45lbs. of graded seed are sufficient, and that this rate of seeding can be continued with confidence when free stooling varieties are planted. The results of the very early and sparse stooling variety ("S.H.J.") are slightly in favour of the heavier seeding, but the advantage so gained is so slight that the extra amount of grain obtained is only a few pounds more than the extra amount of seed required for planting.

RATE OF SEEDING EXPERIMENT (OATS).

For this experiment two varieties were used, *i.e.*, "Burt's Early," an early maturing and sparse stooling variety, and "Algerian," a late and free-stooling verity. The rates of seeding were the same in both cases, viz., 30 lbs., 45 lbs. and 60 lbs. per acre, the plot planted at the rate of 30 lbs. per acre being treated as the control. The plots were planted on the 13th May.

The results are set out in the table hereunder:—

RATE OF SEEDING EXPERIMENT (OATS).

Variety "Algerian"—Planted 13th May, 1926.—Superphosphate 22 per cent. 150lbs.

Grain Yields.

Rate of Seed per acre.	Computed Yield per Acre.				Average Yield, 1926.	Percentage Yield, 1926.
	Section 1.	Section 2.	Section 3.	Section. 4.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs	bus. lbs	
45lbs.	19 38	16 22	17 16	18 14	18 3	110
30lbs.	10 28	15 20	15 22	15 32	14 16	100
60lbs.	17 36	17 22	17 14	18 0	17 28	108

Variety "Burt's Early—Planted 13th May, 1926.

Rate of Seed per acre.	Computed Yield per Acre.					Average Yield, 1926.	Percentage Yield, 1926.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs	bus. lbs.	bus. lbs.	
45lbs.	13 22	13 36	14 0	13 30	14 16	13 31	98
30lbs.	14 4	14 22	13 20	14 10	13 18	14 4	100
60lbs.	15 8	14 0	11 18	13 20	14 0	14 7	100

As these results are for one year only no definite conclusion can be arrived at. It is, however, surprising to note that the results of the sparse-stooling variety are so even, whilst those of the free-stooling variety are in favour of the heavier rate of 45lbs. per acre. This is the reverse of what may have been expected, and may be due to the sparse-stooling variety containing a greater number of seeds per bushel than the freer-stooling one, which has larger and heavier grain.

RATE OF SUPERPHOSPHATE EXPERIMENT.

The rate of superphosphate experiment is conducted to determine what is the most profitable quantity of superphosphate to apply on this type of country for wheat. Three rates are used, viz., 75 lbs. (control), 150 lbs., and 225 lbs. per acre.

The variety "Nabawa" was planted on 13th May at the rate of 60 lbs. per acre.

Little or no difference could be noticed between the two heavier rates of application of superphosphate during the growing period of this experiment, but there was a considerable difference in favour of the heavier dressing compared with that of the control plot (75 lbs. per acre). This plot was not so dense, nor did it have such a robust healthy appearance.

The results for this year, together with the average results for the past two years, are shown in the table hereunder:—

RATE OF SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELDS.

Variety "Nabawa"—Rate of Seed 60lbs.—Date planted 13th May, 1926.

Rate of Superphosphate per acre.	Computed Yield per Acre.				Average Yield, 1926.	Percentage Yield, 1926.	Percentage Yield, 1925-26.
	Section 1.	Section 2.	Section 3.	Section 4.			
	bus. lbs.	bus. lbs.	bus. lys.	bus. lbs.	bus. lbs.	%	%
150lbs. ...	16 48	16 24	16 48	16 16	16 34	147	137
75lbs. ...	11 28	10 48	10 32	12 16	11 16	100	100
225lbs. ...	20 16	19 20	17 28	18 0	18 46	167	138

These results indicate in no uncertain manner that the amount of 75 lbs. of superphosphate per acre can be considerably increased with advantage on this class of soil.

OAT VARIETY TRIAL.

In this experiment nine varieties were planted, and the early variety, "Burt's Early," was treated as the control plot. The plots were repeated eight times, five being harvested for grain and three for hay. The seed was planted at the rate of 40 lbs. per acre with an application of 112 lbs. of superphosphate per acre. The plots were planted on the 11th May.

The results are for one year only and are set out in the table hereunder:—

OAT VARIETY TRIAL.

GRAIN YIELD.

Planted 11th May, 1926—Seed 40lbs. per acre—Superphosphate 22 per cent. 112lbs.

Variety.	Computed Yield per Acre.					Average Yield, 1926.	Percentage Yield, 1926.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.		
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	
Burt's Early (Control)...	10 0	12 32	10 0	11 16	9 32	10 32	100
Mulga	7 32	10 16	10 16	9 32	9 0	9 16	89
Ruakura	6 8	7 32	5 0	5 32	5 24	6 8	60
Glen Innes No. 7 ...	14 0	16 16	12 8	15 0	12 32	14 0	135
Guyra	14 28	14 32	16 0	14 32	17 16	15 8	149
Burt's Early (Control)	9 32	12 16	7 32	11 0	9 0	10 0	100
Burt's Early (Control)...	9 24	10 0	7 32	10 8	10 8	9 24	100
Algerian	14 0	16 32	13 16	16 16	16 16	15 16	157
Fulghum	8 16	10 16	9 8	10 0	7 16	9 0	92
Lachlan	15 16	18 24	15 24	12 16	12 16	14 32	148
Wilga	10 24	13 32	10 0	12 16	12 8	11 32	118
Burt's Early (Control)...	9 16	9 24	7 32	11 24	12 16	10 8	100

OAT VARIETY TRIAL.

Seed, 40lbs. per acre—Superphosphate (22%), 112lbs. per acre—Planted 11th May.

HAY YIELDS.

Varieties.	Computed Yield per Acre.			Average Yield per Acre.	Percentage.
	Section 1.	Section 2.	Section 3.		
	cwt. qrs. lbs.	cwts. qrs. lbs.	cwt. qrs. lbs.	cwt. qrs. lbs.	%
Burts Early (Control) ...	19 2 0	23 1 20	21 0 16	21 1 12	100
Mulga	22 0 16	24 1 20	26 1 4	24 1 4	116
Ruakura	13 0 0	14 3 4	14 3 12	14 0 14	69
Glen Innes No. 7 ...	19 2 12	22 3 20	22 2 0	21 2 20	107
Guyra	17 1 20	19 1 4	13 3 4	16 3 9	85
Burts Early (Control) ...	17 3 12	21 3 12	18 2 8	19 1 20	100
Burts Early (Control) ...	20 3 12	18 3 12	19 1 20	19 2 14	100
Algerian	16 0 8	16 1 4	13 2 16	15 1 9	78
Fulghum	14 2 16	16 1 4	15 2 24	15 2 5	79
Lachlan	22 1 4	21 2 24	21 0 16	21 2 14	110
Wilga	16 1 12	18 1 12	18 0 24	17 2 7	89
Burts Early (Control) ...	19 3 4	19 0 0	20 1 20	19 2 27	100

These results are for one year only, and the indications are that mid-season and late varieties are the most suitable for grain production, whilst better hay returns may be expected from the early maturing varieties on this class of soil.

THE SEASONAL PLANTING EXPERIMENT.

The object of this experiment is to determine the most suitable time to plant the different types of wheat according to their maturity—Late, Mid-season, Early and Very Early.

To suit the requirements of the experiment the varieties used were "Yandilla King" (Late), "Nabawa" (Mid-season), "Gluyas Early" (Early), and "S.H.J." (Very Early). "Gluyas Early" was treated as the control, and was planted in May.

Three plantings were made in April, May and June, and the plots were sown at the rate of 45 lbs. of seed and 112 lbs. of superphosphate per acre. The May and June plots, in addition to being cultivated in April, were also cultivated at the time of planting.

The results for this year, together with the average results for the May and June sections for the past two years, are set out in the tables hereunder—

SEASONAL PLANTING EXPERIMENT.

APRIL PLANTING.

GRAIN YIELDS.

Seed, 45lbs. per acre.—Superphosphate, 22%—112lbs. per acre.

Date of Planting.	Variety.	Computed Yields per Acre.					Average Yield per Acre, 1926.	Percentage 1926.
		Section 1.	Section 2.	Section 3.	Section 4.	Section 5.		
		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%
14th May...	Gluyas Early (Control)	9 52	11 36	11 12	10 40	10 16	10 43	100
22nd April	S.H.J.	5 44	6 48	6 24	7 4	6 8	6 26	61
	Gluyas Early ...	10 8	9 4	9 20	10 16	8 40	9 30	91
	Nabawa	9 52	11 52	11 36	10 56	10 32	10 58	108
	Yandilla King ...	12 16	13 12	12 32	12 32	12 16	12 34	125
14th May	Gluyas Early ...	10 24	9 44	9 20	9 44	9 52	9 25	100

MAY PLANTING.

GRAIN.

Seed, 45lbs. per acre.—Superphosphate, 112lbs. per acre.

Date Planted.	Variety.	Computed Yield per Acre.					Average Yield per Acre 1926.	Percentage, 1926.	Percentage, 1925-26.
		Section 1.	Section 2.	Section. 3.	Section 4.	Section 5.			
1926.		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
May 14	Gluyas Early (Control)	11 28	12 0	12 24	12 48	13 12	12 22	100	100
May 14	S.H.J.	8 48	9 12	9 12	9 44	10 56	9 34	77	89
May 14	Nabawa	10 32	12 40	12 48	12 24	12 40	12 13	101	106
May 14	Yandilla King ...	11 20	13 4	12 48	12 40	14 0	12 22	105	106
May 14	Gluyas Early (Control)	10 32	11 20	12 48	12 32	13 4	12 3	100	100

JUNE PLANTING.

Seed 45lbs. per acre.—Superphosphate 112lbs. per acre.

Date Planted.	Variety.	Computed Yield per Acre.					Average Yield per Acre 1926.	Percentage, 1926.	Percentage, 1925-26.
		Section 1.	Section 2.	Section. 3.	Section 4.	Section 5.			
1926.		bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
May 14	Gluyas Early (Control)	12 48	15 4	14 0	13 36	13 52	13 52	100	100
June 14	S.H.J.	5 44	7 20	7 12	7 20	7 12	6 58	50	55
June 14	Gluyas Early ...	6 24	7 44	6 16	7 4	6 40	6 49	50	54
June 14	Nabawa	7 4	7 4	7 52	5 52	6 32	6 53	50	59
June 14	Yandilla King ...	7 4	6 56	7 12	7 28	6 56	7 7	52	56
May 14	Gluyas Early (Control)	13 36	13 52	14 8	13 52	12 48	13 39	100	100

SEASONAL PLANTING EXPERIMENT.

PERCENTAGE RESULTS—1925-26.

Varieties.	April.		May.		June.	
	1926.	1925-26.	1926.	1925-26.	1926.	1925-26.
	%		%	%	%	%
Gluyas Early	91	...	100	100	50	54
S.H.J.	61	...	77	89	50	55
Nabawa	108	...	101	106	50	59
Yandilla King	125	...	105	106	52	56

Although the experiment has only been carried out at this farm for one year with the April section, and for two years with the May and June sections, the wide difference between the yields of the May and June planting are so great that the conclusion can be drawn that June planting cannot be practised with advantage. They also indicate that the late and mid-season maturing varieties are the most suitable for the main crop when planted in May, and that a late variety may with advantage be planted in April. This agrees with the opinion formed by observations and experience gained elsewhere on similar classes of country.

PRESERVES.

Margaret A. Wylie.

Inspectress and Organiser Domestic Science, Education Department.

At this season of the year, when fruit is plentiful, the subject of its preserving is of interest to the keen housekeeper. Several methods occur instantly to the mind:—drying, candying, and lastly, bottling, amongst others. The latter method will be the topic of these short notes. The primary object of all these methods is to so protect the fruit that harmful bacteria will be unable to cause decay, through the breaking down of the fibre bringing about fermentation.

"Processing" is the term applied to the operations of first sterilising, or sufficiently heating to destroy bacteria; and secondly, excluding air so that bottled or canned goods will keep. The utmost cleanliness must be observed in the care and attention to detail with regard to equipment, as well as to the actual "processing" itself.

Fruit.

All fruit should be prime and in full season, graded to suitable size for the bottles to be used.

Initial preparation consists in washing the fruit quickly, and then proceeding as follows:—

1. Peel apples and pears, and dip in salt water.
2. Quarter core, and pack as compactly as possible.
3. Dip peaches into boiling water. This ensures the skinning easily. Cut in half and remove stones. Pack compactly, overlapping edges.
4. If apricots and nectarines be large, cut and halve; plums and berries bottle whole.

Equipment.

The jars which are capable of being hermetically sealed give the greatest success. They are so constructed as to form a vacuum during the heating process. The inside air is driven off by the intense heat, whilst the pressure of the heavier air outside prevents the lid from lifting, ensuring that the contents are air-tight.

Full directions for preserving along these lines accompany Fowler's Sterilising Outfit.

Other bottles or jars in common use are glass-topped jars, provided with wire clamps attached to necks; also screw-topped jars with aluminium lids. New rubbers are essential. Secure the best and see that they perfectly fit the jars. They dry and deteriorate with age, even if only used once. The lids of the bottles should be carefully examined; any with flaws or even pin-prick holes should be rejected. Lacking a Fowler's Outfit one may use a large boiler, or washing copper, for holding the bottles during sterilisation.

Sugar is the great preservative, but water which has been sterilised, *i.e.*, brought to a boiling point, may be substituted if sugar is scarce. This latter

is used in the form of syrup. A suitable syrup is made in the proportion of three or four pounds of sugar to one gallon of water—boiled for ten minutes, then strained, if necessary, and allowed to cool.

Procedure.

1. Fruit treated as detailed above and packed in the jars.

2. Pour over it the sterilised cold water or syrup, slowly, allowing liquid to sink well down, thus avoiding air bubbles. Fill to brim.

3. Fit on rubbers in groove of neck of the jar. Fit or screw lids evenly on top. A slab of wood should be placed at the bottom of the boilers to permit bottles to stand evenly, preventing contact with the boiler itself.

4. Place bottles in boiler, about one inch apart, in cold water reaching about half-way up the bottles. (No packing is required when the wooden slab is used.)

5. Bring water slowly to boiling point. Allow to boil half an hour, or longer for hard fruits. This is termed the quick method.

6. A slow cooking gives better colour, less broken fruit, and a clearer syrup, and is done by keeping the water round the bottles at simmering point for about two hours.

7. Remove bottles, thoroughly tighten lids of screw-topped jars, and ensure that clips of the other types remain untouched, until fruit is perfectly cold.

8. Test jars to see if air-tight by turning upside down. If syrup oozes from lid, tighten again.

N.B.—When using screw-topped jars, it is advisable to have an extra bottle filled with syrup alone, sterilised with the others, and kept at same temperature. From this, the bottles of fruit may be refilled, if evaporation has taken place.

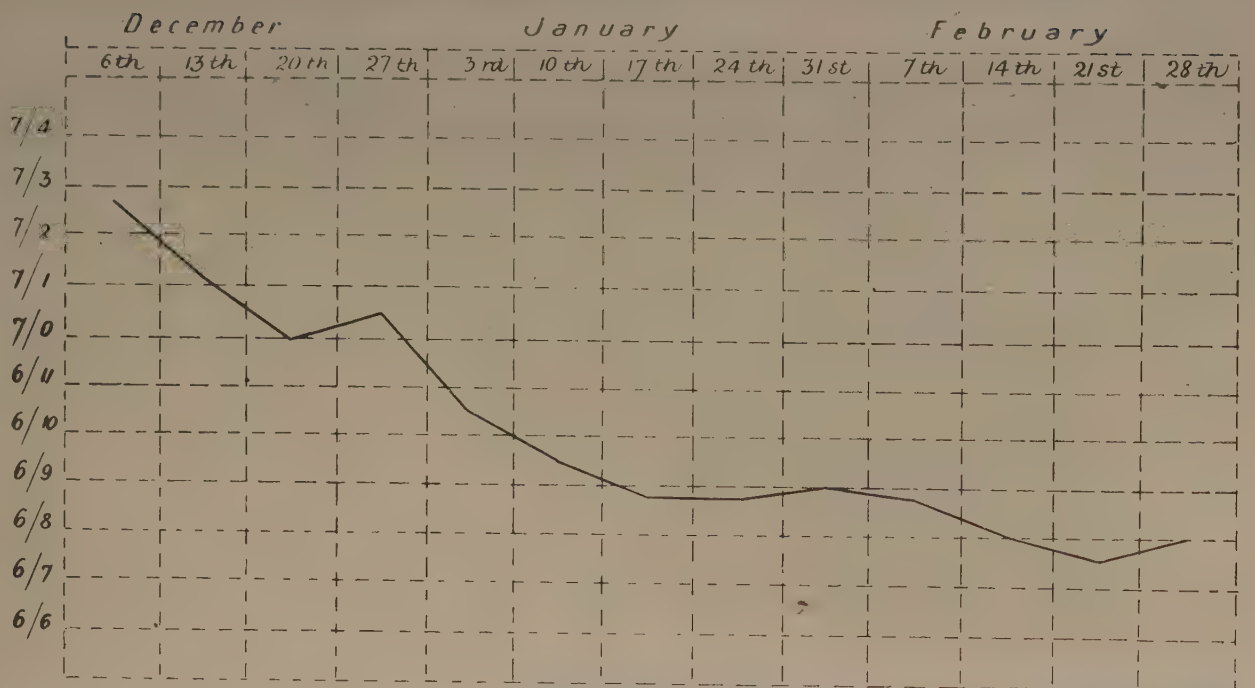
Reasons for Fruit rising in Jars.—(a) Imperfect packing; (b) a sudden rise in temperature; (c) too great heat; (d) too heavy a syrup.

Other homely methods of bottling are as follows;—Proceed as above detailed in packing and using sterilised water or syrup. Then fill jars to overflowing; fix rubbers and lids; place in cold oven, light fire, heat gradually, and when fruit shows signs of slight shrinkage, remove from oven. Screw lids tightly, turn upside down testing for leaks, etc.

Still another method is to have two pans containing syrup. Bring both, at the same time, to boiling point. Into one, place just sufficient fruit to be thoroughly immersed, and cook till tender. Lift carefully, and pack cooked fruit in bottles. Fill with syrup from other pan to overflowing. Affix rubbers and rings, securing these tightly. This method is unique in that the fruit is only handled once.

The bottled fruit should be kept in a cool place till required.

RETURN of WHEAT PRICES PER BUSHEL C.I.F. & E. LONDON.



Compiled from Figures kindly supplied by the Co-Operative Wheat Pool of W. Australia

METEOROLOGICAL INFORMATION.

1926.

STATIONS.	DECEMBER, 1926.						JANUARY, 1927.						FEBRUARY, 1927.					
	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.				Maximum.		Minimum.				Maximum.		Minimum.			
	Mean.	Highest.	Mean.	Lowest.	For Month.	Average.	Mean.	Highest.	Mean.	Lowest.	For Month.	Average.	Mean.	Highest.	Mean.	Lowest.	For Month.	Average.
					inches	inches					inches	inches					inches	inches
Chapman State Farm	90·7	110·1	62·3	52·7	0·30	0·21	91·6	110·3	63·6	52·9	0·04	0·30	91·9	103·3	61·7	53·0	·10	0·55
Geraldton	86·5	107·7	63·6	52·0	0·20	·13	84·5	107·2	66·3	59·6	0·04	·23	83·4	100·2	64·8	53·0	*Nil*	·32
Walebing	88·7	102·4	58·5	48·0	*Nil*	·48	90·4	106·0	58·9	48 0	·07	·35	90·1	106·2	59·6	49·4	·20	·46
Perth	83·5	101·6	63·6	49·8	·03	·58	82·6	101·6	60·2	53·0	·47	·34	83·0	100·1	61·1	49·1	·15	·45
Kalamunda	77·6	100·1	58·1	43·0	0·03	·86	83·5	101·8	56·9	51·0	1·08	·54	84·4	101·2	58·3	47·0	·25	·72
Bunbury	80·4	94·4	54·8	38·4	·25	·61	81·6	95·8	56·4	48·0	·72	·45	81·5	95·2	56·6	50·4	·22	·57
Bridgetown	81·9	99·2	47·7	36·0	·43	·81	82·9	99·0	50·7	43·0	·69	·55	85·2	100·1	48·8	38·0	·23	·66
Albany	69·2	81·4	56·2	45·8	1·02	1·17	70·4	85·6	56·9	51·0	5·90	·74	72·0	88·6	58·0	52·4	·43	·94
Merredin State Farm	88·4	103·1	57·7	42·1	·06	·64	89·8	102·0	58·9	51·1	·09	·63	89·6	103·0	59·0	47·9	·02	·61
Northam	86·6	102·0	58·4	47·1	*Nil*	·35	87·6	103·1	59·4	52·0	·02	·29	90·6	107·0	59·6	48·2	·04	·41
York	87·8	105·0	56·6	44·0	·05	·44	88·4	101·0	58·2	51·0	·03	·33	89·1	103·0	67·3	48·0	·01	·47
Narrogin State Farm	83·3	99·0	51·4	40·1	·11	·64	85·2	98·4	52·6	42·3	·05	·34	Not received				...	·62
Katanning	80·9	98·0	52·1	43·0	1·05	·61	83·9	95·1	54·1	48·0	·51	·37	84·3	101·4	53·6	44·0	·06	·59
Cape Leeuwin ...	70·6	80·0	59·5	52·8	·39	·89	70·8	78·0	60·3	53·0	2·20	·66	72·9	86·2	60·9	54·8	·70	·87

MARKET REPORT.

The following particulars of the approximate quantity of chaff available for auction at the metropolitan chaff and grain sales, held in Perth during the months of December, January, and February, also the minimum and maximum prices ruling for f.a.q. to prime quality wheaten, have been supplied by Messrs. H. J. Wigmore & Co., Limited, of Wellington Street, Perth.

December—Quantity, 1,650 tons.
Maximum price, £6 15s. per ton.
Minimum price, £5 10s. per ton.

January—Quantity, 1,450 tons.
Maximum price, £6 17s. 6d. per ton.
Minimum price, £6 5s. per ton.

February—Quantity, 1,450 tons.
Maximum price, £7 per ton.
Minimum price, £6 5s. per ton.

At the time of writing our previous report for this Journal (in December last), the market for f.a.q. to prime wheaten chaff stood at £5 10s. per ton, and we mentioned that we had received reports from the districts extending from Northam to Baandee to the effect that the quantity of hay cut in these districts was considerably less than last season, and that we anticipated higher prices in the near future. Our own produce representatives have now confirmed these reports, and as predicted by us, higher prices are ruling, value at this date, 10th March, 1927, being £6 17s. 6d. per ton, with every indication of this price being at least well maintained.

Oaten Chaff.—Samples of prime green are scarce, the value of this quality being £6 to £6 2s. 6d. per ton; f.a.q. being in demand at £5 15s. On the other hand, plentiful supplies of medium quality are arriving, prices of this ranging from £5 to £5 5s. per ton.

Oats.—As anticipated during December and early January the market was glutted, and heavy feeds were selling as low as 2s. 2d. per bushel. However, this price was very unsatisfactory from farmers' standpoint, and they refrained from consigning freely. The result, of course, being a firmer market; the value of good clean feeds now being 2s. 8d. to 2s. 9d. per bushel, medium quality being 2s. 4½d. to 2s. 6d. per bushel.

Wheat.—There is some demand in Perth for f.a.q. samples from 5s. 2d. to 5s. 3d. per bushel; smutty and inferior at lower rates, according to quality.

WESTERN AUSTRALIA—DEPARTMENT OF AGRICULTURE.

List of Bulletins available for Distribution.

No. 5.—*Fruit Drying.* By J. F. Moody. Free.
No. 15.—*Root Rot.* By A. J. Despeissis. Free.
No. 20.—*The Pruning of Fruit Trees.* By J. F. Moody. Price 2s. 6d.
No. 30.—*Codlin Moth.* L. J. Newman. (Reprint from "Journal.")
No. 46.—*Fruit Packing and Marketing and Exporting of Fruit.* By J. F. Moody and J. Ramage. Price 1s. 6d.
No. 47.—*The Poultry Keeper's Manual.* By G. Allman. Price 1s.
No. 49.—*The Feeding of Horses.* By Professor Paterson and G. L. Sutton. Free.
No. 57.—*Vermin Destruction.* By A. Crawford. Free.
No. 60.—*The Farmer's Clip.* By J. J. Mahood. Free.
No. 68.—*Flaying and Treatment of Hides.* By R. E. Weir. Free.
No. 72.—*The Potato: Its Cultivation, Pests, and Diseases.* By G. N. Lowe. L. J. Newman D. A. Herbert. Free.
No. 74.—*Tobacco Growing: Notes for Intending Planters.* By G. W. Wickens. Free.
No. 79.—*Sheep on the Wheat Farm and their Management in W.A.* By H. McCallum. Free.
No. 83.—*Horticulture and Viticulture.* By A. Despeissis. Price 2s.
No. 87.—*Sheep Feeding Experiments: State Farm, Chapman,* 1920. By G. L. Sutton and F. Vanzetti. Free.
No. 88.—*Light Land: Conference.* By G. L. Sutton. Free.
No. 90.—*Stock Waters: Standard for Composition of.* By E. A. Mann. Free.
No. 93.—*The Home Tanning of Sheep and other Skins.* By H Salt. Free.
No. 94.—*The Dingo.* By B. W. Leake. Free.
No. 96.—*Poison Plants of W.A.* By D. A. Herbert. Free.
No. 99.—*Australian White.* By G. L. Sutton. Free.
No. 101.—*Cotton Cultivation.* By G. L. Sutton. Free.
No. 103.—*Kerosene Method for Eradicating the Zamia Palm.* By G. K. Baron-Hay. Free.
No. 104.—*Stickfast Flea.* By J. G. C. Campbell. Free.
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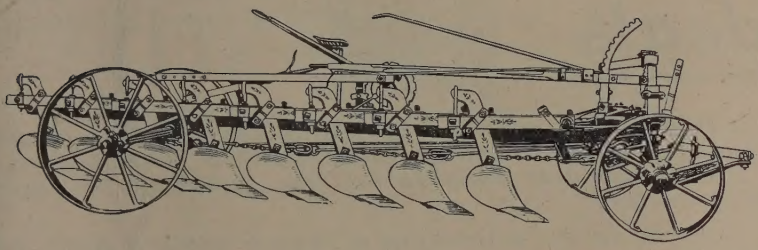

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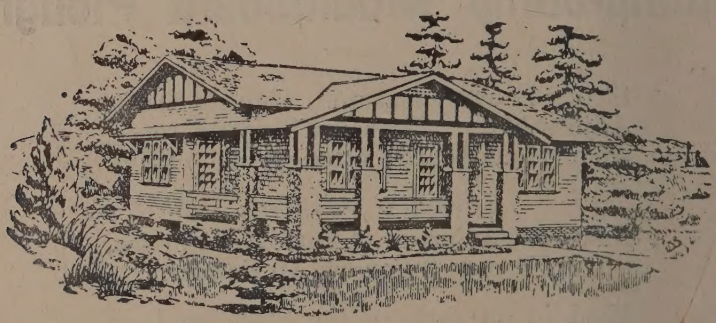

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